Chapter 7
Feedback and Reflection to Promote Student Participation in Computer Supported Collaborative Learning: A Multiple Case Study

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Abstract This chapter describes a multiple case study in Computer Supported Collaborative Learning (CSCL). Feedback and reflection were components in a program in which 5th grade students worked with CSCL in small groups. The feedback and reflection was focused on improving the interaction processes of the students, especially on supporting elaborative contributions in the groups. The interaction processes in two groups were closely followed and analysed, and portrayed through examples. The main research question was: How do interaction processes

between students develop within a learning environment in which feedback by the researcher/teacher on elaboration is provided and student reflection on elaboration is encouraged? We expected that feedback and reflection about the quality of the participation, elaboration in particular, would in the initial stages result in better quality participation and more elaborated contributions of the students later on in the process. Looking at the patterns in the interactions over the subsequent lessons, we may conclude that our hypothesis was confirmed. However, the results show significant differences in the quality of participation between individual students and between the two case groups which appear to be related to students' characteristics and group composition, that is, ability and sociocultural background. The implications for teaching are discussed.

7.1 Introduction

Computer Supported Collaborative Learning (CSCL) is aimed at facilitating knowledge sharing and at enhancing the interaction of students engaged in group work. Research shows that CSCL is an activating and motivating arrangement for learning, but an often-heard complaint is that the interactions of students working in CSCL remain shallow (Fischer & Ostwald 2002; Stahl 1999).

In most CSCL designs the teacher plays a central role when it comes to shaping the educational context. The teacher clarifies the learning goals, formulates the task (or helps to formulate it), and suggests what resources can be used to complete the task. The teacher also provides some form of feedback on the process or the completion of the task. Although a great deal of research has focused on the interaction between students, little is known about the effects of teachers' feedback concerning the quality of the interaction in cooperative learning environments (Ross & Rolheiser 2003).

Collaboration in itself is neither effective nor ineffective. It works under certain conditions (Terwel 2003). Theoretical and empirical evidence concerning some of these conditions has led us to design and investigate a learning environment from a sociocultural perspective which will be described later in this chapter.

The main research question was: How do interaction processes between students develop within a learning environment in which feedback by the researcher/teacher is provided and student reflection is fostered? In answering this question we will look, in particular, at the development of the participation of the group and the individuals in the group with respect to:

1. their use of the participation-supporting features of the cscl program (program affordances);
2. their active participation (amount of contributions and number of words per message); and
3. their provision of elaborative contributions.

We will relate these participation measures to student characteristics, the feedback provided, the students' reflections on this feedback and the intentions they express for improving their participation for the upcoming lesson.

This chapter is structured as follows. Firstly, the theoretical background will be described, resulting in the presentation of the basic model guiding the study. Secondly, an outline of the educational program will be presented and the implementation of the program will be described. Thirdly, a section will be devoted to the research design and methods, reporting on the instruments used and the procedure followed. In the results section of the chapter the feedback and interaction processes in the student groups will be described and analysed. The chapter closes with conclusions, discussions, and some suggestions for further research.

7.2 Theoretical Background

CSCL is based on a combination of theoretical notions and strategies developed in the field of cooperative learning and the use of the computer as a medium for supporting communication. Although CSCL may be regarded as a new approach, it is important to recognise the theoretical roots of CSCL and to learn from the vast body of knowledge from theories and research in the field of cooperative learning, in particular, the teacher's role in enhancing active participation of all students (Ross & Rolheiser 2003).

Most cooperative learning theories emphasise the importance of active participation, interdependence, verbalising thoughts, resource sharing, giving and receiving high-level elaborations, and inducing socio-cognitive conflicts as the primary mechanisms for learning and development. In stimulating these processes the role of the teacher in cooperative learning is pivotal. Providing feedback to the students is one of the essentials of cooperative learning and of CSCL. What do we know from the field of cooperative learning about the role of the teacher and more specific about monitoring, feedback, reflection and assessment? In the following we will address four, partly overlapping, theoretical perspectives.

First, we mention the motivational theory of Slavin. In this theory two strategies are central: individual accountability and group reward (Slavin 1995). If both individual students and subgroups are assessed and rewarded, participation and resource sharing within cooperative groups will be fostered and consequently learning will occur. Slavin's motivational theory leans heavily on theories of management and direct instruction in which the reward structure plays a central role.

Second, the interdependence theory of Johnson and Johnson (1994) also contains valuable information about the role of the teacher (see chapter 1). Effective cooperative learning arrangements should make students interdependent through, for example, the provision of assignments and problems that can only be solved when students work together. To reach a good result the students have to be aware that they are dependent on each other. Group evaluation on common group goals can aid the development of interdependence.

The teacher's role in stimulating reflection is another aspect of this theory that warrants attention. Reflection functions to review how well group members are functioning and how to improve the work processes. Only a small number of

research studies have been undertaken to examine the importance of the regulation of group processes during group work (Johnson et al. 1990; Yager et al. 1996) and most were conducted in face-to-face contexts. We found two studies only, one by Ulicsak (2004) and one by Dewiyanti (2005), which investigated the issue of regulation within a CSCL environment. There are, however, various researchers who have stressed the importance of reflection in learning processes (Bull et al. 2002; Dillenbourg & Self 1995). Reflection can be described as members' actions that are helpful or unhelpful in making decisions about what actions must be taken to reach the group's goals. These goals may be made explicit or remain implicit in the categories of evaluation.

Third, Cohen's sociological expectation states theory may be mentioned as one theory in which the role of the teacher in enhancing participation of all students is highlighted (Cohen et al. 2004; Cohen & Lotan 1995). This theory explains why some students will dominate group activities and why others are ignored even if their contribution is of value to the group. Central in this theory is the notion of status within the group. Status characteristics can be related to ability, gender, or ethnicity. High-status students will dominate the discussions and teachers can make a difference to group performance by assigning status to students who tend to be ignored and by designing assignments that require multiple abilities. Both strategies can be applied to stimulate participation of all students.

Both Cohen's and Slavin's theories address the important role of the teacher respectively by using a reward structure and by providing feedback on the social processes within the cooperating group. While both theories reveal important social aspects of fostering participation and learning in cooperative groups, they hardly address the question of how the teacher can monitor group discussions strategically aimed at collaborative knowledge building and individual learning.

We now turn to a fourth category of perspectives which may be captured under the term cognitive elaboration. In this category, special attention is given to the role of the teacher in monitoring and scaffolding the cognitive aspects of learning in groups. To put it more specifically, how can the teacher support the construction of concepts and strategies in small group discussions? Within this category of theories, the work of Webb may be mentioned (Webb & Farivar 1999), which stresses the importance of high level elaborations, such as giving and receiving explanations. In addition, Webb investigated how teachers can influence these collaborative processes in small groups.

The work of Brown and Palincsar (1989) must also be mentioned as an important perspective on guided cooperative learning and individual knowledge acquisition. The main concepts in their theory are elaboration in cooperative groups and the guiding role of the teacher. Their theory was applied to their model of *reciprocal teaching*. Under the heading of the role of conflict, Brown and Palincsar gave attention to elaboration as one of the key processes in achieving deeper understanding.

Conflict is another factor that can be seen as a catalyst of change, with explanation, elaboration, justification, warrants, and backing being ingredients in the process. The facilitating effect of cooperative learning depends on a number of key

factors: the initial competence of the student, the social status and serious opposition which raises questions about her own view. However, Brown and Palincsar (1989) also mentioned that "Although conflict may be an essential trigger, it has been argued that change is more readily the result of processes of co-elaboration and co-construction"(p. 407).

Crook (1994) took a similar view and saw peer collaboration as having three cognitive benefits: articulation, conflict, and co-construction. Through peer collaboration students are challenged to make their ideas explicit and need to clearly articulate them. When students disagree in their interpretations, conflicts may arise and the students must mutually justify and defend their positions, reflecting on their own (mis)conceptions. Crook's concept of co-construction is based upon Vygotsky's (1978) belief that learning is the sharing of meaning in a social context. Students build upon each others' ideas and, thus, they co-construct (local) knowledge and a shared understanding collaboratively.

The first three perspectives described above address the social participation within cooperative groups, while the fourth category of perspectives focuses on the cognitive (elaboration) aspects of collaboration in small groups. The fifth perspective integrates social and cognitive aspects into a sociocultural theory.

Sociocultural theorists have argued that knowledge construction can be stimulated by offering opportunities to students in a relevant cultural practice. In our sociocultural perspective the notion of guided co-construction has a central place (Van Dijk et al. 2003a,b). From this perspective collaborative, reflective learning under teacher guidance is a basic pattern for the organisation of learning processes. The joint activity can be conceived of as a kind of guided co-construction or guided reinvention in which each participant can profit from cultural resources offered by the others and by materials used in the activity. These resources enable each participant to accomplish more than they could do on their own. In this way, participating in such endeavor can be seen as jointly constructing a zone of proximal development (Van Dijk et al. 2003a,b). In this study co-construction is guided by a teacher providing feedback on the way that students elaborate their contributions.

The sociocultural perspective is the theoretical background for the main concepts in our study: student characteristics, teacher feedback, student reflection, and participation. These concepts and their mutual relationships may be brought together in a model. Fig. 7.1, represents the conceptual model guiding the present study. In this model Participation is taken as the dependent variable.

Fig. 7.1 can be read as follows. Student participation is directly related to students' own resources such as ability level, sociocultural background, and prior knowledge (see the horizontal arrow). However, participation is mediated by (a) teacher's feedback and (b) individual and group reflections on performance. Teacher feedback is given on an individual and group level so that it will be related to the development of the groups' and the individual students' participation.

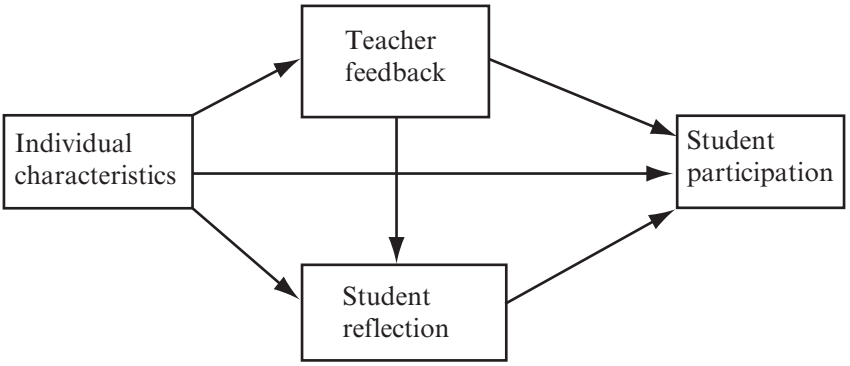

Fig. 7.1 Explanatory model for students' development

7.3 Outline and Implementation of the Program

7.3.1 Outline

Building on this theoretical and empirical evidence for the conditions under which collaboration works, we designed a specific learning environment, which will now be outlined.

We designed an educational program about nutrition and health to be implemented in a CSCL environment: the client version of Web Knowledge Forum (WKF). WKF was developed by Scardamalia and Bereiter of the Ontario Institute for Studies in Education at the University of Toronto. The WKF software provides several facilities to enhance collaboration between the users. Among them, the build-on facility (reacting to a previous note or question by building on it) and the scaffolds (to be used as sentence openers to help students formulate their initial contributions and reactions to each other) are the ones used in this implementation. They help to engage learners in collaboration on one hand and to facilitate knowledge construction on the other (see Fig. 7.2 for an example of how the discussion is displayed on the screen).

While Knowledge Forum facilitated the program by the embedded facilities, the specific curricular content, the guidance and the face-to-face interactions were also essential elements as viewed from our theoretical perspective.

The curriculum content about nutrition and health was situated in a known cultural practice: cooks collaborating in a kitchen to make decisions about what food to buy, what dishes to prepare, and how to prepare the food in a healthy manner, all within the context of a restaurant. The title of the program was "The smart chef."

The researchers conducted all lessons. In doing so they combined the researcher's role with that of developer and teacher. Students in each participating class were divided into heterogeneous groups of four, according to gender, ability, and socio-ethnic background.

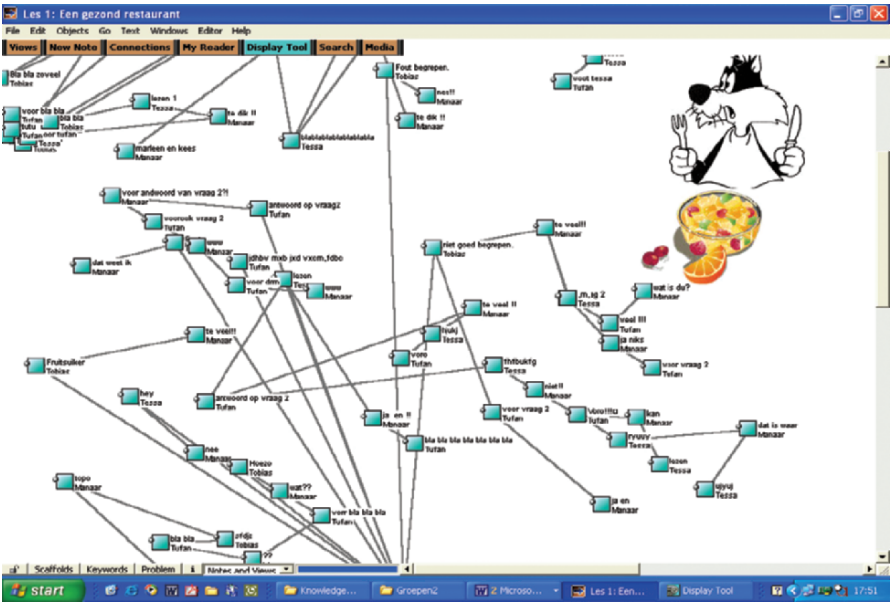

Fig. 7.2 Display of student's contributions (in Dutch language)

The program for the students consisted of an introduction lesson, 3 lessons with discussion questions and two intermediate feedback and reflection lessons. In designing the program we used a combination of face-to-face and computer-supported interaction. The reason for this, in line with the basic concept of guided co-construction, is the importance of including reflection and feedback under the guidance of the teacher that will result in a deeper understanding of the concepts, structures and strategies at stake.

7.3.2 Implementation

The Introduction Lesson

After the teacher introduced the curriculum content and general aim of the lessons to come, the students were given time to practice with the Knowledge Forum program. After this practical introduction, the students received a hand-out with the golden rules (see Table 7.1 below). The students received some time to read these rules, whereupon the teacher explained that the way students react to each other's contributions in the Knowledge Forum is very important.

The golden rules were made to help the students find the answers to the discussion questions together and in a constructive way. It was very important for the students

Table 7.1 The Golden rules

1	When you agree with someone, write down clearly what you agree on precisely
2	Provide clear answers (State why you think this or give a clarifying example)
3	Ask each other (clear) questions
4	Be sure to ask for clarification if you don't understand what is said
5	When asked, provide an explanation and be sure it is helpful to the other
6	It is all right to disagree as long as you explain why you disagree

to be clear on what they were to say to each other (Rule 1 and 2). They were to use as many words as they needed to be precise. Short messages can easily be misunderstood. The students had to make clear what part of the previous message they were reacting to, for instance by repeating the part of the sentence they did not understand (Rule 3). Instead of saying, "I don't understand", the student should say: "I don't understand what you mean by saturated fat." The teacher told the students that it is important to ask each other questions. The teacher stressed the fact that there is no such thing as a stupid question and that it is very smart to ask questions. In fact, the question is already half the answer (Rule 4). The students in the groups were obliged to answer each others questions (Rule 5). They would be evaluated on the help they gave each other. In CSCL environments it is important that students react to each other in agreeable ways, but the teacher should point out to the students that it is also important to disagree with each other sometimes (Rule 6). This is not to be disagreeable, because in providing an explanation or an argument why they disagree, the students can help clear up misunderstandings or even remove incorrect understandings. This is part of learning together. To illustrate the rules the students completed some easy assignments with examples of students reacting to each other.

The teacher explained the function of the sentence openers in the Knowledge Forum program. The ways of reacting to each other in a constructive (and elaborated) manner were scaffolded by the following sentence openers: "I think …"; "My question is …"; "That's right, because …"; "Yes, but …"; "No because …"; "Remark:…"; "Explanation:…" "What do you think?" and "An example:…".

The sentence openers mirror the golden rules in students' support for each other by providing constructive and elaborated reactions to each other. For instance, the sentence opener "No, because …" will remind students that disagreeing is okay as long as you explain why you disagree with somebody else's contribution. In the introduction lesson the teacher also pointed out other procedural tasks that support interactions, such as adding titles to the contributions that cover the domain specific content of the contribution.

The Computer Supported Lesson

In the first lesson the students read a chapter of *The Smart Chef*. This textbook covered some important ideas about nutrition and health. The students tried to imagine that they were the cooks in a particular restaurant. They had to make

decisions about the purchase of ingredients, learn to read the labels, decide where to store the food, to compose healthy menus, and to then prepare it in a hygienic manner.

After the students had read a chapter (about six pages), the teacher handed out the discussion questions on paper and the students were given time to prepare the answers on their own. An example discussion question is shown below.

Example Discussion Question

You have read Chapter one of the textbook 'The Smart Chef'. Now you can find the possible answers to the question below. Fill out your answers on this sheet. Make clear sentences and write down everything carefully. Make sure you don't forget anything. After you have found as many possible answers, you go and sit down behind your computer and tell the people in your group what you've found. Perhaps they found different answers to yours. Might they be right too?

Question: Mind the Sugar

Derreck is a new chef in our restaurant. He proposes to put a new recipe on the menu. "Let's make a chocolate pudding!" he says "and then we will add a sugar coating and put a cookie on the top!" Another chef, Mary, says: "Yes, Derreck, that sounds great but it is very unhealthy. There is far too much sugar in it and all sugar is bad for you. Sugar is never good for you." Is Mary right?

The teacher told the students in advance that it is important to first prepare the answers to these questions individually, because it will make the following discussion a lot easier when they come prepared. Before the students sat at their own computers to start the group discussion in the Knowledge Forum, the teacher stressed the point that the students first had to write down their own answers, before reading and reacting to the ideas of the other students in their group. In this way a diversity of ideas would be presented as a starting point for discussion. An average group discussion behind the computer lasted 45 minutes. The students had to discuss two discussion questions in one session.

The Feedback and Reflection Lesson

In the feedback and evaluation lesson the teacher started by reading out loud the group evaluation forms in front of all the participating groups (see Table 7.2). This enabled the teacher to stress the importance of the students performing as groups and introduced a between-groups competition element. It was expected this would support the group members in becoming a real group that would actively collaborate in order to discuss in a constructive and rich manner.

Table 7.2 Group evaluation form

1. How was the display of the discussion organised on the screen?
2. How did the group members make use of the sentence openers?
3. Did the contributions concern the content of the assignment?
4. Did the participants give their own answers before reading and reacting to the others?
5. Were there clear titles to the messages?

After this teacher-led part of the evaluation, the students joined their group members and each group received a print-out from their own previous week's discussion and a group evaluation form (See Table 7.2). On the discussion printout, the teacher had marked her comments next to the printed contributions. These comments were directed towards the extent to which the contributions were elaborated. Understanding how to improve an interaction process and then applying it is cognitively demanding; providing the feedback comments next to the students' own worked examples might help reduce the cognitive load by demonstrating the principles of elaboration in a concrete and personally relevant way.

When the students had finished reading both the group evaluation form and the discussion printout, the teacher handed out the group assignment. In this assignment the students were asked as a group to think about the things they would like to do differently next time. The answers given formed the group's intentions for the following lesson.

7.4 Research Design

Two cases taken from a more extensive case study (Fakkert 2006) will be presented. The research design was a multiple case study including two collaborative groups from a larger sample.

The educational program was implemented in grade 5 (students 7 years of age) from four elementary schools. To investigate what the students had learned from the group feedback and the individual feedback, two cooperative groups of four students were selected. We chose two groups of students from different primary schools and of different composition (e.g. ability level). Furthermore the two groups showed interesting differences in the development of their participation. In both groups we selected two students from a total of four to describe the individual level in greater depth.

7.4.1 Instruments and Procedures

In this study a combination of quantitative and qualitative measures were used. The interaction processes, in particular concerning teacher feedback, student participation and student reflection, were described and analysed by video footages, observations,

interviews along with descriptions of student contributions and teacher's guidance. In Fig. 7.1 the main concepts are presented. Below the concept-related variables and instruments will be described in the sequence of the model in Fig. 7.1.

7.4.2 Student Characteristics and Prerequisites

Five measures were used to describe the following student characteristics:

(a) gender, (b) socioeconomic (SES) background, (c) IQ percentile scores, (d) reading comprehension, and (e) computer skills. These measures were included because they can be regarded as characteristics and prerequisites that seem to be related to the participation of the students (Prinsen et al. 2006).

Socioeconomic background was determined by using the scores from a National SES scoring system (Esis, 2006).

The Standard Progressive Matrices test (Raven, 1976) was administered to determine general ability (using IQ percentile scores). Scores on a national standardised reading comprehension test (CITO, 1998) were collected to determine student's achievement level in reading comprehension.

Before the lessons started, a questionnaire was administered to determine relevant skills and attitudes. The Computer Skills Scale (CSS) was administered. General computer skills were determined by providing the children with a list on which they could indicate the computer skills they thought they possessed (25 items). A list of general computer skills was taken from a Dutch monitor instrument (Gennip et al. 2002). All instruments proved sufficiently reliable with Cronbach's alpha's of 87 and higher.

7.4.3 Teacher Feedback

Teacher feedback to the group was collected from what the researcher/teacher had written on the group-feedback sheet. This feedback was directed towards the correct use of the participation-supporting features in the computer program (We call these supportive features "participation-supporting" because their use is aimed at improving participation. For instance, a clear organisation of display on the screen makes it easier to follow the thread of the discussion; the use of the sentence openers scaffolds the provision of elaborations; students providing their own answers before reacting to the others, stimulates idea diversity and the provision of clear titles enables fellow students to see at a glance the content of a particular contribution). The group feedback also included an overall assessment of the group being on- or off-topic.

Teacher feedback to the individual students was measured by counting the positive and critical comments written by the researcher/teacher next to the contributions which the students had made to the previous week's lesson. To generate a percentage,

the number of comments was divided by the total number of contributions in that particular lesson.

7.4.4 Student Reflection

To determine how the students, as a group and individually, had reflected on their participation and the feedback they had received, a number of measures were used.

Firstly, we videotaped the groups in order to capture the reactions to the feedback the students had received both verbally and on paper and to capture how they cooperatively formulated the group's intentions for the following lesson.

Secondly, we collected and analysed the written responses of the students to the feedback (one week after the first lesson and one week after the second lesson). The group collectively distilled points of improvement or maintenance out of the feedback (intentions for the next lesson) and the group members wrote these down on the assignment form. The extent to which the students wrote down their intentions on the assignment sheet provided an indication of how actively involved the group members were in completing this assignment.

Thirdly, a semi-structured interview was held with the chosen individuals per group in which we asked them what they thought of the feedback and the reflection on it. Did they find it useful and relevant? We also asked them what they would like to do differently the next time you work with Knowledge Forum. Because the implementation of this program was an innovation in the participating classrooms we wanted to know how the students had experienced the lessons. Johnston (1997) has pointed out that there is very little research informing us on how students view educational change, because no one ever asks them. That is why we included some interview questions in our research asking the students what they thought of the program. Because the project included two group reflections, the chosen students were interviewed twice.

7.4.5 Student Participation

Student participation was measured in several ways in each lesson/discussion. The first method involved an evaluation of the way in which the students made use of the participation-supporting features. The evaluation of their correct use of these features was recorded on the group-feedback sheets that were read and handed out to the students for later feedback.

The students were also supposed to actively participate in the discussions. Active participation was measured in two ways. First, we counted the number of messages that every student had contributed. We also included another measure of participation, namely the number of words per message. In this research it is assumed that this measure provides an objective measure of determining how elaborated the content of the messages was.

Finally, to determine if student contributions were sufficiently elaborated, we counted the percentage of positive and critical feedback comments on elaboration that the researcher/teacher has written down next to the students' contributions. This count gave us an indication of the quality of student participation.

7.4.6 Analysis

The development in the student participation was analysed in several ways. One way was to examine whether the evaluations made by the researcher/teacher of how the students made use of the participation-supporting features of the program changes over the lessons.

We also considered the improvement in the quality of the messages by looking at the increase in positive feedback comments by the researcher/teacher. These feedback comments were used to evaluate whether the contributions were sufficiently elaborate. The decrease in critical feedback comments was another indicator of quality improvement.

Furthermore, we described how the students adopted the points of improvement indicated in the teacher's feedback and in their own reflections and if and how these were reflected in subsequent actual improvements in their participation. In explaining the changes we took all of the feedback into account as the group members had read both the feedback intended for the whole group and their individual feedback. Furthermore, the students shared their individual feedback with the other group members.

In the analysis we also included an evaluation of the performance in lesson three. With these data, the developments between lessons 2 and 3 are included. However, the evaluations of lesson three were not fed back to the students. Additionally, there was no group reflection and there were no interviews after this third lesson.

Finally, we will relate the student characteristics of the individual cases to the (development in the) different participation measures and we will make a comparison between the two groups in their developments.

7.5 Results (Group A)

The results will be presented as follows. The results section is subdivided into three parts: Description and analysis of group A; description and analysis of group B; and, a comparison between groups A and B.

7.5.1 Description and Analysis of Group A

Group A, consisted of two boys and two girls: Tessa, Tufan, Tobias, and Manaar. To obtain a more in-depth description and analysis of the interaction and responses

Table 7.3 Student characteristics for group A

Learner characteristics	Gender	Socio-economic background	IQ percentile	Reading comprehension percentile	Computer skills
Tessa	Girl	1.25 (lower socio-economic)	50th	25% below the national average	33
Tufan	Boy	1.9 (foreign background)	50th	25% below the national average	33
Tobias	Boy	1.0 (average)	95th	25% highest scores	29
Manaar	Girl	1.0 (average)	50th	25% below the national average	30

of the students, Tessa and Tufan were taken as examples. Table 7.3 contains the initial student characteristics of the students in this group.

Table 7.3 shows some differences in student characteristics. Tessa and Tufan differed in their social backgrounds but show the same IQ percentile level, the same reading comprehension level, and the same level of computer skills. Manaar and Tobias both come from a family with average social background. Manaar's IQ percentile as well as her reading level also matched those of Tessa and Tufan. Only Tobias scored relatively high on general IQ and reading comprehension.

7.5.2 Feedback and Reflection on Lesson 1: Group A

The group was criticised for the way they used the participation-supporting features in the first lesson. The discussion layout on the screen was messy, they did not often use the sentence openers, they strayed from the subject, and their titles were unclear. The group received this critical feedback when the teacher read the evaluation out loud to the class, mentioning the group members' names. The one thing the group had done correctly was provide their own answers to the question before reading and reacting to the answers of the others.

When the group received the reflection task, requiring them to think about the things they could do differently next time, they seemed to be conscious of the fact that they had made incorrect use of the participation-supporting features. On their assignment sheet they collaboratively wrote down that they could improve the group discussion by sticking with the subject and by tidying up the layout of the discussion on the screen.

On the video recording we see the two girls starting to read the comments written next to the printed-out discussion while the boys started to reread the group evaluation. Later on they switched roles. Tessa read the reflection task to the group and wrote down the comments that the group members made. All the members contributed at least one point to improve on, for instance, to remain civil. Tessa contributed some of her own points. She wrote down that they had

to use the sentence openers more often and that they had to stay serious and suggest normal titles. Tessa also wrote down on the sheet that they had to provide explanations.

Feedback and Reflection: Tessa and Tufan

Tessa received positive comments from the teacher on the elaborations in her messages. Even though she contributed the fewest number of messages to the discussion, Tessa contributed positively to the group discussion. Tessa not only expressed her agreement with others but also explained why. Another positive aspect which was noted was that she answered all the questions directed to her and she did not react to any contributions that were not serious. Tessa also received the fewest critical comments from the teacher on her use of elaborations (one comment on the fact that she did not explain to her group mate on what point she disagreed with him).

The following excerpt shows a positive interaction in the group, demonstrating Tessa's ability to integrate two answers and her correct use of the sentence opener "Yes, but…". This was one of the few examples in the discussion where they all used the sentence openers. The titles were unclear and not very serious. The feedback that was given is written next to the contributions.

Excerpt 1: An exemplary interaction with positive teacher comments:

Title: **From?** By: Tobias Yes, but… don't you grow fat when you eat fat and you don't turn it over into energy?	*Good explanation, Tobias*
Title: **Not from???** By: Tufan I think: you will become fat especially when you eat too much of it.	*Right, Tufan*
Title: **blablablabla** By: Tessa Yes, but… also when you eat too much fat and you don't do sports or other exercise.	*Well done, putting the two contributions together, Tessa*

The example above shows the only positive comment that Tufan received. Twenty percent of his contributions received a critical comment, asking him to elaborate on his thoughts. Even though he was the most active participant in his group with 28 contributions, he did not seem to have taken the task too seriously. The following excerpt shows how he did not provide an explanation when asked for one by Manaar.

Excerpt 2: Failure to provide an explanation:

Title: **answer to the second question** By: Tufan I would choose this dessert because it tastes better.	*Which dessert, Tufan?*
Title: **for the answer to question 2?** By: Manaar … yes but why!!!???	*Good thing you are asking for an explanation, Manaar. Try to ask nicely.*
Title: **also for question 2** By: Tufan I think: just because	*Tufan, you have to give an explanation if somebody asks you to explain.*

When we asked Tessa what her personal intentions were for the next lesson she commented that she would try to get the others to contribute in a more serious manner. Even though she and the group received some critical comments on the (in) correct use of the supporting features of the computer program and on the provision of elaborations, she did not mention this fact. When asked about the comments she received regarding her elaborations, she said she only remembered about three comments, and that they were all positive. This means that she forgot about the critical comment asking her to explain on what point exactly she disagreed with one of her group mates.

When we asked Tufan what he thought of the feedback he had received he said: "I think I was talking about other things most of the time … more so than the other group members". He compared his performance to the performance of the other group members. By reading the feedback for the group members, he said that he had learned that it was necessary to "stick to the subject." He intended to be more serious.

7.5.3 Feedback and Reflection on Lesson 2: Group A

The overall picture of how the group collaborated in the second lesson is not completely positive. Even though they had written down all the points on which they needed to improve in their reflection after lesson 1, in this particular lesson they did not really improve. The students still did not make correct use of the participation-supporting features of the program. The group seemed to use the sentence openers a bit more often, but now they did not use the correct ones (i.e., the ones to fit with their contribution type). There were fewer distractions from the discussion subject. They still did not always find the possible answers to the questions.

The group was encouraged, on the feedback sheet of the second lesson, to try and find more answers next time. The students were also encouraged to provide more explanations to each other, in particular Manaar, who did not perform as well in this respect as she did in the first lesson.

The group did show improvement on the participation measures. On average, the group members contributed fewer messages in comparison with lesson 1 (i.e., lesson 1: 23, lesson 2: 15), but the mean number of words per message was higher: 12 words per message in comparison with nine words before. This might mean that the group sent more content-rich messages. Looking at the number of positive and critical comments made about their elaborations, we see an improvement for the group as a whole. This is encouraging and might also be due to the fact that they tried to stick to the subject this time.

When the group received the reflection task, asking them to think about the things they could do differently in lesson 3, they did not copy all the critical comments they had received from the teacher as they had done in their reflection assignment after the first lesson. Keeping the discussion layout clear and suggesting more suitable titles did not seem to concern them. They did write down their intention to stick to the subject of the lesson and that they would always use the sentence openers. They also repeated their concern with providing explanations.

Feedback and Reflection: Tessa and Tufan

In line with the group's participation in this lesson, Tessa also sent fewer messages, but on average used more words per contribution (i.e., 13). She received a greater percentage of positive comments on her elaborative behaviour than she did in lesson 1, but she also slid back on one point. She did not provide explanations to others when she agreed or disagreed with them, while this was marked as one of her strong points in lesson 1.

Tessa adhered to her intentions for this lesson by providing five comments regulating the group. She told her group mates in these messages that they should stick to the subject more often. She also maintained her positive behaviour of reacting only to messages with serious knowledge and providing an answer for every question directed at her. She did not improve on her use of the procedural aspects, such as suggesting suitable titles and using the sentence openers.

Tufan shows a clear improvement in his participation in this lesson. He made fewer contributions (i.e., 17), but his behaviour improved and he received more positive feedback on his elaborative behaviour. The following excerpt is an example of a clear elaboration Tufan had made. We can also see here that Tufan used the "I think…" sentence opener, while he could more correctly have used "Yes, but …".

Excerpt 3: Tufan making progress in elaborating his answers

Title: **Was not read well**
By: Tobias
Remark: after a week the food had gone bad

Title: **For…**
By: Tufan
I think: yes but she was talking to her friend for an hour and she was too late, she should have put it in the freezer before.

Very good, Tufan. Could you add why she should have put it in the freezer sooner?

Tufan still showed some diversion from the content of the discussion, even though he intended to change this behaviour. He did start using more diverse sentence openers.

In her reflection, Tessa noticed that there was more use of the sentence openers in the second lesson and that more correct answers were given. Still she intended to make sure that the group kept to the subject and kept using the sentence openers. In the classroom feedback the teacher spent some time explaining the relevance of the different sentence openers and their use in providing the correct type of reactions. Again Tessa did not remember any of the specific feedback comments made next to her contributions. In the interview Tufan, again, showed his intention to stick to the subject next time.

7.5.4 Evaluation of Lesson 3: Group A

In the final lesson the group showed improvement on almost all of the feedback categories, even though they had not shown concern for all of the categories in their group reflection assignment. The group as a whole improved on keeping the discussion display as clear as possible and they all improved on their provision of titles with each contribution. Furthermore, they stuck with the subject this time. The interactions were positive, showing questioning and rebutting of answers by using "Yes, but…" sentences. It has to be noted that a lot of time was spent on contributing regulative messages which were superfluous.

Evaluation of Lesson 3: Tessa and Tufan

Tessa contributed five regulative messages (out of her total of 14 sent messages) telling her group members to use the sentence openers, as she had intended to do. In this lesson, her messages contained more words (i.e., 15) than the averages of her group mates (Table 7.4). She further showed improvement in the use of sentence openers and titles. However, she still forgot to add an explanation when she agreed or disagreed with someone. We found some additional information in the questionnaire the students had filled out before the lessons that might explain the omission. In this questionnaire Tessa reported that she did not like explaining things too much. Tessa consistently reacted only to messages with serious content. This might be a reason for the small number of contributions in the first lesson in comparison to that of her

group members. Here we see a sign of negative interdependence: how individual progress can be negatively affected by other members of the group. In contrast, when the discussions on the lessons became more serious, the participation of the group members appeared to be more equitable.

Tufan showed a very positive attitude to the group members this time. He contributed some regulative comments about sticking to the subject. He also asked some clarification questions ("My question is: why did you choose that one, Tobias?") and he corrected Tessa on an important issue in a friendly manner ("Remark: the chicken has to be cooked at 75 degrees, not at 40"). His participation leveled off from 28 contributions in the first to 14 in the third lesson, but in this case the quality of his interactions actually improved despite this decline (Table 7.5). The feedback and group reflections appeared to have made a positive contribution to Tufan's development in this group.

Reflecting in her interview, Tessa told us that she experienced the feedback-method as useful, because it showed her how she and her group members could improve. Still, she showed more concern for the (mal-) adaptive behaviour of her group members, than for her own points of improvement, however, this did not prevent her from showing improvements. She did find it odd that some feedback comments were repeated over and over again. Tessa showed a clear concern for the functioning of the group and a concern for equal participation during the reflection moments. This is a clear sign of positive interdependence.

7.5.5 Overall Developments in Participation and Elaboration in Group A

We now turn to some general trends in the participation and elaboration from lesson 1 through 3 of group A. In the final lesson we can see a clear improvement in most of the feedback categories compared to the earlier lessons. The group members' improvements on elaborative behaviour (Table 7.4) are especially encouraging. It seems that the students became more aware of the expectations and that they tried to improve on several aspects, as they had intended.

The group means in Table 7.4 show that the average total of sent messages declined, but in this last lesson the group averaged 13 words per message (this was 9 in lesson 1). As the group improved on most of the categories, it appears that the decline in contributions does not affect the effectiveness of the collaboration. The contributions made by the group showed improvement in content over the lessons. Teacher feedback and student reflection clearly influenced the interaction pattern from lesson 1 through 3, especially after the feedback on lesson 1.

With reference to the learning characteristics (i.e., their resources as presented in Table 7.3), there are some differences and similarities between the two individual cases. Tessa and Tufan are from different socioeconomic backgrounds (Tufan being from an immigrant background), however, their IQ, reading comprehension score and computer skills are the same. Tufan participates more actively in the first lesson

than Tessa but we know from the descriptions that the quality of his participation was low in comparison. Both Tessa and Tufan make gains in the number of words per message. They both contribute 14 messages in the last lesson, with Tessa writing slightly longer messages. Since they are also equally active, it may be concluded that their identical IQ scores, reading comprehension scores, and computer skills have more influence on their active participation than their differences in gender and socioeconomic backgrounds.

We now turn to some trends in the quality of participation and elaboration from lesson 1 to lesson 3. Table 7.5, which concerns the feedback on student's elaborative behaviour, shows that all group members made gains in positive feedback (only Manaar regressed in the second lesson). In the end, it was almost unnecessary to make critical comments on their contributions. They all declined practically to zero percent in the frequency of critical comments on their elaborative behaviour.

Table 7.4 Development of individuals and the group on active participation measures for group A

Name	Lesson 1 counts of the participation measures	Lesson 2 counts of the participation measures	Lesson 3 counts of the participation measures
Tessa	18 contributions	17 contributions	14 contributions
	10 words/message	13 words/message	15 words/message
Tufan	28 contributions	17 contributions	14 contributions
	9 words/message	10 words/message	12 words/message
Tobias	17 contributions	12 contributions	16 contributions
	11 words/message	11 words/message	12 words/message
Manaar	30 contributions	13 contributions	10 contributions
	7 words/message	12 words/message	12 words/message
Group mean	23 contributions	15 contributions	14 contributions
	9 words/message	12 words/message	13 words/message

Table 7.5 Development of individuals and the group on elaboration feedback measures: Group A (numerator = N-feedback; denominator = N-contributions)

Criterion	Lesson 1	Lesson 2	Lesson 3
Name	Positive feedback comments on elaboration	Positive feedback comments on elaboration	Positive feedback comments on elaboration
Tessa	3/17 (18%)	4/17 (24%)	4/14 (28%)
Tufan	1/28 (4%)	2/17 (12%)	2/14 (14%)
Tobias	1/18 (6%)	2/12 (16%)	3/16 (21%)
Manaar	2/30 (7%)	0/13 (0%)	4/10 (40%)
Group	7/93 (8%)	6/59 (10%)	13/54 (24%)
Criterion	Lesson 1	Lesson 2	Lesson 3
Name	Critical feedback comments on elaboration	Critical feedback comments on elaboration	Critical feedback comments on elaboration
Tessa	1/17 (6%)	3/17 (18%)	1/14 (7%)
Tufan	5/28 (20%)	1/17 (6%)	0/14 (0%)
Tobias	6/18 (36%)	1/12 (8%)	0/16 (0%)
Manaar	3/30 (11%)	7/13 (56%)	0/10 (0%)
Group	15/93 (16%)	12/59 (20%)	1/54 (2%)

By relating Tessa and Tufans' learning characteristics to their elaboration measures in Table 7.5, we draw the following conclusions. Tessa and Tufan show similar patterns in positive and negative comments from the teacher. Tessa starts off more favorably, but they both show an increase in positive feedback and a substantial decrease in critical feedback between lessons 2 and 3. Again we cannot pinpoint a clear influence of the initial differences in socioeconomic background and gender on this development. Teacher interventions, however, seem to be clearly reflected in the developments in participation of all students from lesson 1 to 3.

7.6 Results (Group B)

7.6.1 Description and Analysis of Group B

This group consisted of two boys and two girls: Kristine, Rishi, Kevin, and Yit Man. In the following, Kristine's case is described in greater depth.

Table 7.6 Student characteristics of group B

Learner characteristics	Gender	Socio-economic background	IQ percentile	Reading comprehension level	Computer skills
Kristine	Girl	1.25 (lower socio-economic)	25th	10% lowest scores	23/33
Rishi	Boy	1.25 (lower socio-economic)	25th	25% below the national average	33/33
Kevin	Boy	1.25 (lower socio-economic)	25th	15% well below national average	33/33
Yit Man	Girl	1.25 (lower socio-economic)	75th	On the national average	14/33

Table 7.6 contains the initial student characteristics of the students in this group. All students came from a lower socioeconomic background and Rishi's and Kristines' parents were born outside the Netherlands. Except for Yit Man, who had an above average IQ percentile score, the other group members had a below-average score on the IQ test. Only Yit Man had an average score on the reading comprehension test. The others scored below or well below the national average.

With regard to the students' computer skills, Yit Man showed very few computer skills. Rishi and Kevin appeared to be the most skilled users in the group, while Kristine showed average scores on the scale.

7.6.2 Feedback and Reflection Lesson 1: Group B

The group evaluation on their use of the participation-supporting features after the first lesson was not completely positive. The group members stuck to the subject,

providing their own answers before reacting to the others, but the discussion layout was messy and the sentence openers were forgotten in most cases (especially by Rishi). The titles did not refer to the subject of the message. The group interacted in a positive way, and was also very active.

In the group reflection, almost all of the critical feedback that the group received on their use of the participation-supporting features was translated by the group into personal improvement points. They wrote the names of each group member followed by a point to improve on. Kevin wrote: "we have to talk about the subject and unravel the lines on the discussion layout." There was no mention of making better titles. Rishi intended to make better use of the sentence openers; a point which was stressed on the group evaluation form.

Feedback and Reflection: Kristine and Rishi

Kristine received some positive feedback comments for contributing questions to this discussion. She was an active participant, contributing 17 messages, almost all of which were questions. Her questions were of good quality, asking for elaboration. The way Kristine was participating is somewhat surprising, taking into account her low computer skills and her low reading comprehension score. The next excerpt provides an example. Kristine makes correct use of the sentence opener 'My question is…'.

Excerpt 4: A question asking for elaboration:

Title: **answer** By: Rishi I think: I agree with Derek because he chooses the fruit dessert.	*Explain why you agree with Derek, Rishi*
Title: **For Rishi** By: Kristine My question is: but why?	*Good question! Kristine*

Rishi did not answer Kristine's questions and consequently received a critical comment. The first answer that Kristine contributed to the second discussion was elaborated well. The answer and what followed is shown in the next example:

Excerpt 5: A properly elaborated first answer:

Title: **yoghurt dessert** By: Kristine I think: that Mary is right because she says that there is also a lot of sugar (calories) in fruit, in fruit there are fruit sugars and sugar makes you grow fat and it's bad for your teeth.	*Good explanation, Kristine!*

Title: **you can become ill**
By: Rishi
Remark: you can become ill — *What makes you ill, Rishi? You are not being clear*

Title: **illness**
By: Kristine
My question is: but how can you become ill? — *Good question! Kristine*

Kristine's question shows that Rishi's answer was not clearly elaborated. Rishi received the most critical comments on his (non)elaborative behaviour. His messages were on average only eight words long. Even though Rishi provided explanations for most of the questions in the discussion, his answers were always short and he never used the explanation sentence opener.

In her reflection Kristine wrote: I'm going to make better questions and I have to give better answers. Rishi intended to make better use of the sentence openers.

7.6.3 Feedback and Reflection Lesson 2: Group B

The overall picture of how the group interacted in the second lesson is a positive one, resulting in positive comments by the teacher. The group kept the layout of the discussion clearer than previously and stuck to the lesson subject, as they had intended. They could still improve on the use of sentence openers. Rishi still failed to use them, even though he intended to do so. When the group evaluations were read to the class, there was some extra attention paid to the subject of asking clear questions. When asking"What do you mean?" it is better to ask "What do you mean *when you say*…?' (repeating the words in the message to which you are reacting). This way there will be less misunderstanding.

The group was, again, actively involved in the lesson, contributing an average of 15 messages per person. For all the participants, the number of words per message went down in comparison to lesson 1. Looking at the number of positive and critical comments made about their elaborations we do not detect any serious improvements either. As the reflection sheet shows, the group focused its attention primarily on improving the procedural aspects of working with the program.

In their reflections it was acknowledged by the students that they did not make correct use of the participation-supporting features of the program. During their reflection on their performance the group was video-taped. The group members first took turns in reading out loud, one by one, the contributions to the previous week's discussion. They also read out loud the feedback comments which were written next to the contributions. Kevin appointed the reader and directed attention to the feedback comments. After they had gone through the whole of the previous week's discussion, Kevin read the assignment to the group and Yit Man wrote down the points of improvement on the sheet. Rishi asked Yit Man to write down "Use

more sentence openers." Kevin added "to understand each other better" and "to explain better" and "to give better answers". Rishi said "to make better sentences, to write the answer clearly" and "talk more about the subject."

Feedback and Reflection: Kristine and Rishi

Kristine adhered to her intention to keep asking questions. Seventeen of her twenty-three contributions were questions. It is not really clear if Kristine asked all these questions to get her group members to elaborate or because she really did not understand. Rishi did not make any progress toward contributing more elaborate answers in this lesson. His word count went even further down, to six words per message. He received many critical comments asking him to elaborate. The next excerpt shows how Rishi provides a non-answer to a question which was not directed at him in the first place. When Kristine asks him what he means, Rishi loses track of the conversation completely.

Excerpt 6: Miscommunication

Title: **good opinion** By: Kevin That's right, because… you need energy or you'll get weak.	*Good explanation, Kevin*
Title: **Kevin** By: Kristine My question is: but why?	*Good that you ask, Kristine*
Title: **okay** By: Rishi… Just because	*'just because' is not an explanation, Rishi*
Title: **rishi** By: Kristine My question is: what… just because?	
Title: **just because** By: Rishi … Just because, what is the question?	

Kristine's original question is not answered. Rishi used many short answers in this discussion. It shows a lack of interest in the discussion, even though his inclination to provide answers generally looked positive. Surprisingly, at some points in the discussion Rishi asks his group members to elaborate ("Remark: because, why?" "just because what?"), even though he does not do it himself.

In the interview, Kristine looked back and told us she had misunderstood the first question "I did not know what a 'TV dinner' was." This might explain her short, initial, answer. Kristine is weak at reading comprehension, so she might internalise

fewer answers from reading the text and might sometime not even understand the question. She intended to ask questions in the next lesson. The attention paid to the personal feedback comments on elaboration made Rishi aware of the fact that he had to provide more and better explanations. He intended to do this.

7.6.4 Evaluation for Lesson 3: Group B

In the final lesson the group did not show any further improvements on the procedural aspects, such as the use of sentence openers. The group received fewer positive comments on their elaborative behaviour, but also showed a decline of critical comments. Looking at the quality of the discussion we see the group members showing concern for providing clear answers and understanding what the others are saying. The discussion also showed some clear signs of promotive interaction. They started to ask each other more clarification questions.

Evaluation for Lesson 3: Kristine and Rishi

Kristine contributed a very high number of messages in this lesson (41). Her word count is the same as in the second lesson, with an average of 13 words per message (Table 7.7). Kristine intended to provide good answers and to ask questions, and she did. Sometimes her language use was unclear, but her group members made a point of asking her what she meant to say. Kristine showed that she could ask clear questions (e.g., "My question is: how long can the chicken be kept in the freezer?").

When we look at Rishi's participation in this lesson, not much seems to have changed. One positive aspect is that the percentage of positive feedback comments he receives increases (Table 7.8). In a couple of instances Rishi asked a clarification question in which we see that he did not give up on receiving clarification from Kristine.

Excerpt 7: Rishi keeps asking for clarification

Title: **(untitled)**
By: Kristine
Yes, but… can you put that chicken on the pan in the right way?

Title: **what**
By: Rishi
… what do you mean?

Title: **(untitled)**
By: Kristine
Yes, but… I mean from the chicken

Title: **chicken**
By: Rishi
My question is; what do you mean by chicken?

Rishi also improved his question from asking simply "What do you mean?" to asking more specifically: "My question is: what do you mean by chicken?" In his second message he also made correct use of the sentence opener, "My question is…".

Rishi enjoyed the evaluation lessons. The personal feedback made him realise that he should provide *'longer and better explanations'*. The fact that he realised what his personal points for improvement were did not always translate into a change of behaviour. In the third lesson it seems as though he started to take his responsibility within the group process more seriously.

In her reflection, Kristine told us that she thought the feedback comments were good. She was not very good at formulating to us what exactly she had learned from the evaluation lessons. This seems to be due to her limited language proficiency. All in all we can say that Kristine was a very active participant who made a positive contribution to the group process during the lessons.

7.6.5 Overall Developments in Participation and Elaboration in Group B

The participation measures of group B are presented in Table 7.7.

Looking at the participation measures in Table 7.7, we see that the group is increasingly active with an average of 22 messages per person in lesson 3, but that the word count goes down from 22 words per message in the first lesson to 13 in lesson 3. Their active participation shows a different pattern to the one for group A.

Regarding learner characteristics (i.e., the resources as presented in Table 7.6), there are some differences between the two individual cases. Kristine and Rishi are both from lower socioeconomic backgrounds. Their IQ scores are below average, as are their reading comprehension levels (with Kristine being in the lowest category). However, it appears that the differences between Kirstine and Rishi cannot be explained by their different characteristics as Kirstine does surprisingly well given her scores.

Table 7.7 Development of individuals and the group on active participation measures: group B

Name	Lesson 1 counts of the participation measures	Lesson 2 counts of the participation measures	Lesson 3 counts of the participation measures
Kristine	17 contributions	23 contributions	41 contributions
	16 words/message	13 words/message	13 words/message
Rishi	23 contributions	21 contributions	20 contributions
	8 words/message	6 words/message	7 words/message
Kevin	11 contributions	7 contributions	8 contributions
	31 words/message	30 words/message	21 words/message
Yit Man	2 contributions	8 contributions	19 contributions
	33 words/message	14 words/message	9 words/message
Group mean	13 contributions	15 contributions	22 contributions
	22 words/message	16 words/message	13 words/message

Table 7.8 Development of individuals and the group on elaboration feedback measures: group B (numerator = N-feedback; denominator = N-contributions)

Criterion	Lesson 1	Lesson 2	Lesson 3
Name	Positive feedback comments on elaboration	Positive feedback comments on elaboration	Positive feedback comments on elaboration
Kristine	3/17 (18%)	5/23 (22%)	6/41 (15%)
Rishi	2/23 (9%)	2/21 (10%)	4/20 (20%)
Kevin	6/11 (55%)	4/7 (57%)	2/8 (25%)
Yit Man	1/2 (50%)	2/8 (25%)	4/19 (21%)
Group mean	12/53 (23%)	13/59 (22%)	16/88 (18%)
Criterion	Lesson 1	Lesson 2	Lesson 3
	Critical feedback comments on elaboration	Critical feedback comments on elaboration	Critical feedback comments on elaboration
Kristine	1/17 (6%)	2/23 (8%)	0/41 (0%)
Rishi	8/23 (35%)	8/21 (38%)	1/20 (5%)
Kevin	0/11 (0%)	0/7 (0%)	1/8 (13%)
Yit Man	1/2 (50%)	2/8 (25%)	1/19 (5%)

We now turn to the quality of the elaboration as was measured by positive and negative feedback comments by the teacher on elaborations.

As shown in Table 7.8, the positive feedback comments on elaboration decrease over the lessons, as does the number of words per message. There is, however, some sign of improvement, since the percentage of critical comments decreases greatly in the last lesson.

7.7 Results (Comparison Between Groups A and B)

In this final results section we bring together the group scores from Tables 7.4, 7.5, 7.7, and 7.8 to summarise and compare the patterns between the groups.

In the course of the lessons Group A showed a decline on the average number of contributions, but the content of the contributions was increasingly elaborate as shown by the increase in number of words per message. This was mirrored in the increased positive feedback and the reduction in critical feedback on elaboration by the teacher.

Group B started out with a higher number of words per message and more positive feedback comments on elaboration than group A, but did not show a clear pattern of improvement over the lessons. The mean number of contributions increased from the first to the last lesson while the mean number of words per message decreased. At the same time the group shows a reduction in positive feedback on elaboration.

Even though both groups end up contributing an average of 13 words per message and show a significant reduction in critical feedback in the third lesson, the overall conclusion is that group A seems to outperform group B in their develop-

ment. We see some positive development in the case description of group B but the differences between the patterns of development between the groups seem to reflect the greater difference in student characteristics and the lower resource level of group B as a whole. Except for one student, all group members of group B showed low scores on general IQ and low to very low reading comprehension scores.

7.8 Conclusion and Discussion

In this chapter we described a program directed at improving the interactions within groups of collaborating students in a CSCL environment. Developments made by two groups of students in two 5th grade classes were described in terms of improvements in their participation. The correct use of the participation-supporting features, their active participation and their provision of elaborative contributions were related to the provided feedback, the students' reflections, students' intentions to improve and student characteristics. In both groups, two case students were followed in their learning processes in order to present examples of development over the lessons.

The main research question was: How do interaction processes between students develop within a CSCL learning environment in which feedback by the researcher/teacher is provided and student reflection is stimulated? It was expected that feedback and reflection regarding the quality of the participation in the initial stages will result in better quality participation and more elaborated contributions of the students later on in the process. In answering this question we looked, in particular, at the various contributions of the individual students and the groups in relation to the feedback and reflection moments.

Our general conclusion is that the feedback by the researcher/teacher and the reflection moments contributed to the development of the students in terms of participation and elaboration. This positive contribution confirms our expectations. However, it has to be noted that conclusions drawn on the basis of case studies are bound to be tentative. In this exploration we did not compare the groups to groups of students who did not receive feedback on their participation.

The exploration of the two group-cases and the two individual-sub cases show differences between individual students and between groups. In most cases we were able to trace these differences back to student characteristics or resources in the cooperative group and researcher/teacher's feedback and reflections by the students. To substantiate our general conclusions some general patterns and more specific findings, especially concerning the differences between the two case-groups, will be summarised in the remainder of this section.

We detect some general patterns in the cases. The students did not automise the operations of using the sentence openers and adding comprehensive titles to their messages. Even though they keep mentioning this as a point of improvement in their reflections, they did not consistently improve. Perhaps because they worked in small groups and the contributions were read by most of the students anyway,

they did not see why adding a clear title matters. It might also be that the students did not adopt the usability of the sentence openers because it seemed unnatural to them and it hindered them in providing quick responses, or it may have been that the students did not want to keep their group members waiting. Synchronous chat programs have a fleeting character (Veerman & Veldhuis-Diermanse 2001). Because students take numerous turns, the pressure to react quickly is high. It has to be noted that multiple occasions were observed whereby students started their sentences with, for instance "Yes but…". Sentence openers might thus be seen as a scaffold to be removed after the students have adopted its use.

A positive aspect was the improvement students showed when it came to sticking to the subject of the lesson. It might be that the focus on providing elaborate contributions helps the students focus on the lesson's content. Again, we did not compare the results with groups that did not focus on providing elaborate contributions. There might therefore be other explanations.

We saw how the groups adopted the idea that they should be providing more explanations to each other. In general, the percentage of critical comments of the researcher/teacher on elaborative behaviour declined over the lessons. Even though the number of critical comments increases slightly in lesson 2, they showed a sharp decline in lesson 3.

The students started asking more clarification questions when the lessons progressed. Clarity and clarifications seemed to have become part of students' ideas of how to reach a positive and effective collaboration. We saw the groups developing a sense of positive interdependence. They did not only focus on their personal points for improvement but also paid attention to the feedback their group members received and the feedback they received as a group. They not only realised they were individually responsible for an effective collaboration but also took responsibility for the achievements of their group mates. This sense of positive interdependence is demonstrated in the regulative comments they made in the different group discussions.

All in all, we believe the results are encouraging, given the short-term nature of the intervention and the great number of matters to which the students had to pay attention. Inconsistency in the progress made might be due to cognitive overload (Bruggen van et al. 2002) in the sense that the students had to split their attention with regard to different aspects of the task. The more limited resources of group B in comparison to group A might explain the differences in their measures of improvement. Additionally transfer from awareness of how a skill is used to the actual use of that skill takes time.

Our method of giving feedback on the students' contributions and encouraging students to reflect on the received feedback appears to be appropriate in that it stimulates both individual accountability in the students, and a sense of positive interdependence within the group. The results of the study support the assumption that group discussion processes can be improved by providing feedback on participation and guiding students towards a more conscious use of the principle of elaboration.

In this study the researchers prepared the feedback. It would be interesting to investigate whether the same results are achieved when the teachers themselves

apply this type of learning environment and feedback procedure, or when students rate themselves. We hope to inspire teacher practices with the examples given, while at the same time acknowledging that teachers will always, indeed have to, attach their own interpretations to specific approaches (Leeman & Volman 2001).

We are aware that we have to be careful in generalising the results obtained, given that the study was conducted with a limited population of students. Also, in descriptive studies we have to be attentive to different interpretations. Any reported relations between processes of feedback and reflection on the one hand and developments in student participation on the other have to be treated with care. Further studies will have to substantiate (or reject) the preliminary conclusions from the present study's qualitative analyses.

Our focus was directed towards enhancing student participation. However participation at school is not an end in itself. Schools and classrooms are for learning. The assumption was that promoting participation stimulates learning: those who participate will learn. In this qualitative study, the chain of reasoning, involving student characteristics, student prerequisites, interaction processes, and learning outcomes, is incomplete. This is a limitation that calls for further study into the learning effects of enhancing participation in a CSCL learning environment.

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