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Supervisors:
Dr. Cindy Poortman
& Dr. Kim Schildkamp

External Supervisor:
Wenckje Jongstra (KPZ)

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Reflective Dialogue in Professional Learning Communities

Iris Meijlof | s1252364

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Foreword

Before you lies the Master Thesis "Reflective Dialogue in Professional Learning Communities". The research was conducted in four primary schools across the Netherlands. The thesis was written as part of my graduation at the Master Educational Sciences and Technologies at the University of Twente and commissioned by the Katholieke Pabo Zwolle and their Master Program: Master of Learning and Innovation.

Together with my supervisor of the Katholieke Pabo Zwolle the research question for this thesis was conceived. Successively, my supervisor of the University of Twente and my supervisor at the Katholieke Pabo Zwolle supported me in refining the research question. During this research both my supervisors were always there for me and supported me in writing this thesis by providing me with feedback and help me in my rendering thoughts.

Therefore I want to thank them for their fine guidance and compassion during the entire process of my research. I also want to thank the participants of this research. Without their cooperation I could not have completed this research.

Last but not least, I want to thank my family and friends whose support never left my side. Especially my boyfriend Kevin and my daughter Skylar who mean very much to me and were always there for me. My mother Regine and my mother-in-law Betty, who were always willing to listen to me when I was telling about my research. And, because they baby-sitted my daughter, leaving me with time to spend on my thesis and leaving her with time to enjoy herself.

I hope you enjoy reading this thesis.

Iris Meijlof

Wierden, October 10, 2018

Summary

The Katholieke Pabo Zwolle (KPZ) investigated stimulating and inhibiting factors in Professional Learning Communities (PLC's) in which their students participate. The question for more deepened research originates from this research. Both KPZ as well as different literature sources have shown mixed effects considering the effectiveness of PLC's on student achievement. The challenge is to find depth in a conversation in a PLC meeting. This can be achieved by reflective dialogue.

In this study *reflective dialogue* is being used with regard to Professional Learning Communities. In reflective dialogue the current way of working is reflected upon and reasoned why it is necessary to do something differently. This can be done based on experience and by using data and literature. A model of reflective dialogue within PLC's is introduced. To gain insight into reflective dialogue the research question is: *How do people in PLC's engage in reflective dialogue?*
A number of sub-questions are added to aid answering the research question. Participants were selected from the existing questionnaire of the KPZ. Qualitative research of interviews and document analysis took place. The scheme involves the theoretical framework to which the content of the interviews and documents was compared with to answer the research question(s).

The PLC's in this research engage in reflective dialogue, by using reflective questions and subjects; and by using both experience, data and literature as input for the conversations. These all support the creation of a different view and/or approach. In most cases this appeared to contribute to the PLC's' effectiveness. Therefore it is recommended to other PLC's to use experience, data and literature as initiators and support in a PLC's conversation and to enrich the conversation with depth by reflective dialogue, using reflective questions and reflective subjects.

1. Introduction

Within this era of rapid development the students of today need to be prepared to become knowledgeable, skilled and continuous developers (Schleicher, 2012). In order to obtain this teachers also need to professionally develop themselves. This is necessary to improve the quality of education which is beneficial to the improvement of students' performance (Stoll, Bolam, McMahon, Wallace & Thomas, 2006; Vescio, Ross & Adams, 2008; Prenger, Poortman & Handelzalts, 2017). From Prenger et al. (2017) it became apparent that teacher participation in professional learning communities (PLC's) is considered to be a promising way of providing teachers with professional development and that this on its turn supports student improvement (Stoll et al., 2006; Vescio, Ross & Adams, 2008; Lomos, Hofman & Bosker, 2011).

Reflective Dialogue is one of the essential aspects of effective PLC's (Poortman & Brown, 2018). This is the subject of this thesis. A lot of research has been done with regard to PLC's and the research shows mixed effects with regard to PLC's and their effectiveness on student achievement (Hord, 2004; Stoll et al., 2006; Reichstetter, 2006; Blankenship & Ruona, 2007; Vescio et al., 2008; Lomos, Hofman & Bosker, 2011; Bruns & Bruggink, 2015; Prenger et al., 2017).

The current study focuses on PLC's in the context of the Katholieke Pabo Zwolle (KPZ). KPZ is an institution that educates future primary school teachers. They also provide masters concerning (the professionalization of) education. One of these masters is the Master *Leren en Innoveren* (MLI – Master Learning and Innovating) in which for one teachers learn how to be a teacher leader. These teacher leaders guide (colleague) teachers in their professionalization process. The PLC's within this research are led by these teacher leaders of the KPZ. More about the KPZ can be found under the *description of the organizational context.*

In the thesis the problem is being discussed at first. Then a theoretical framework is provided based on the problem statement. This leads to the development of the research questions. The research questions are answered by conducting qualitative research in the form of interviews with MLI students and one of their colleagues and a document analysis of the MLI students' PRO (reflective assignment) and CPO – *collectief praktijk onderzoek* (collective practice research). These involve the reflection on the professionalization process in primary education and a collective research performed within a PLC which is led by the MLI student in practice to develop education in their schools.

2. Description of the Organizational Context

This study took place as an external graduation assignment at the Katholieke Pabo in Zwolle, The Netherlands. The Katholieke Pabo Zwolle (KPZ) is an independent institution educating future primary school teachers. Next to that they provide opportunities to follow Master programs in which amongst others primary school teachers can become teacher leaders. These teacher leaders are educated in the professional development process and are presumed to lead professional change with regard to education.

The organization exists of a number of divisions, but within the context of this research KPZ kenniscentrum (KPZ knowledge centre) is of interest. This division is led by a lector. The lector is supported by multiple knowledge networks and works closely together with universities and research institutions in the Netherlands and abroad. Results hereof are implemented in their education and in the Centre of Development. The research into Professional Learning Communities is initiated by the KPZ knowledge centre in the Netherlands. This current study into PLC's is guided in cooperation between the KPZ and the University of Twente.

3. Exploration and definition of the (research) problem

This study focuses on Professional Learning Communities in the context of the Katholieke Pabo Zwolle. In general, PLC's are teams of teachers and/or school leaders working together to improve student learning (Hord, 2004; Stoll et al., 2006; Reichstetter, 2006; Blankenship & Ruona, 2007; Bruns & Bruggink, 2015; Prenger, Poortman, Handelzalts, 2017). PLC's can be distinguished at three levels: The whole school forms a PLC; several schools form between-school PLC's or PLC's are formed within schools (Prenger et al., 2017). Within the research of KPZ PLC's are communities that exist *within* primary schools and are led by a teacher leader who is educated in the Master Program Master Leren & Innoveren (Master Learning and Innovation) of the KPZ.

PLC's are subject of this study as they can have a positive impact on school improvement and seem to be a promising way of teacher development (Stoll et al., 2006; Vescio, Ross & Adams, 2008; Lomos, Hofman & Bosker, 2011; Prenger et al, 2017). At the same time, PLC's often show mixed effects according to the literature (e.g.: Hord, 2004; Stoll et al., 2006; Blankenship & Ruona, 2007; Spanneut, 2010; Bruns & Bruggink, 2015; Prenger et al., 2017), but also as experienced by KPZ. Teachers are engaging in PLC's for the exchange of knowledge and experience. On the one hand KPZ notices positive experiences with PLC's, as for example shown in answers to the questionnaire KPZ uses to study PLC's (Hipp and Hufmann, 2010), such as: "*sharing knowledge, learning from each other and preparing together stimulate other ways of thinking and working"; "Having an eye for each other's qualities and be able to appeal on these qualities and the learning from and with each other"; "Building together, collaborating, sharing of responsibility and trust".* On the other hand, there are also some barriers, such as *"Time"; "Holding on to the process, setting clear goals, questioning"; "how professional are we?";The search for where to find external help, for example: which sources are adequate?"* ; *"Collaboratively investigating problems (is) not applicable yet. Sharing knowledge is only based on experience and not a combination of experience, data and literature"; "People already leave when literature is being distributed"; "Depth in meetings is missed".* Accordingly, literature suggests the challenge to find depth in a PLC meeting: i.e. to – reflect on the current way of working, reason why something needs to be done differently and for example use data and literature to improve student learning (Schildkamp, Poortman & Handelzalts, 2016; Brown, 2017; Brown, Schildkamp & Hubers, 2017; Brown & Flood, 2018). Thus, the purpose of this study is to gain insight into how PLC participants engage in reflective dialogue to be able to improve student learning.

4. Theoretical Framework

4.1 Professional Learning Communities

Within-school PLC's consist of a group of teachers within schools that come together to share knowledge and experiences across different but relevant areas of education in a structured manner whereby the insights gained by this sharing becomes practically applied in order to improve student performance (Hord, 2004; Stoll et al., 2006; Reichstetter, 2006; Blankenship & Ruona, 2007; Bruns & Bruggink, 2015; Prenger, Poortman, Handelzalts, 2017).

A PLC is constructed based on a goal set by the school (e.g. the implementation of differentiation in their lessons; Hord, 2004; Stoll et al., 2006; Blankenship & Ruona, 2007; Bruns & Bruggink, 2015; Prenger, Poortman, Handelzalts, 2017; Schaap & Bruijn, 2017). PLC's are considered a promising way of teacher professional development (Yoon, Duncan, Lee, Scarlos & Shapley, 2007; Darling-Hammond & McLaughlin, 2011).

Stoll et al. (2006), Hipp and Hufmann (2010), and Prenger et al. (2017) provide characteristics of PLC's. These characteristics can be considered as factors that influence the operation of a PLC. They are also the basis on which a PLC exists. The factors are all important to the PLC.

The first factor is *shared goal and vision.* This means that members have the same goal and vision as to the educational principles of the school and within a PLC. This contributes to the feeling of belonging to the group. This is supported by *feeling interdependence*. This entails the feeling of responsibility for each other which results in a fashion of working with each other for one another. This is central to *collaboration*. This is of importance to a PLC because it defines how a PLC operates: members of the PLC are all involved in activities, where they are working together, that allow for development for more than one person. Teachers also need to feel that organized *activities are congruent to practice*. This can be explained by activities that can be recognized by teachers as being part of the coherent program of teacher learning. Otherwise the learning might not be valued as important since it does not contribute to practice. *Time* is also considered an important factor. A distinction is made between time for attendance and time being spent. The first indicates the time that is a precursor for attending PLC meetings. The second is the time being spent before a behaviour change is likely to occur. The amount of time needed to actually learn and implement it. Then *leadership*, which involves leadership function as leading initiatives, participation to collaborative groups, supporting colleague's learning and sharing knowledge (e.g. invest time for attending a PLC meeting).

Finally, *trust.* This is an overarching factor with regard to PLC's. This contributes to the extent to which feedback is received and provided to one another. Someone might not feel safe enough to engage in learning from each other when there is a lack of trust. This might prevent teachers to participate in such activities.

Hipp and Hufmann (2010) state that "without a strong culture of trust and respect, and related structures that promote continual learning, it is impossible to build a PLC (p.27)." However, meeting the conditions alone is not sufficient. To establish teacher learning and eventually student learning teachers need to engage in dialogues in which they are encouraged to talk about their practices and collaborate on how the practice can be improved (Hord, 2004; Stoll et al., 2006; Hord, Abrego, Moller, Olivier, Pankake & Roundtree, 2010; Murdaugh, 2017; Prenger et al., 2017). In such a *reflective dialogue*, conversations take place about educational issues or problems. Vescio et al. (2008) state that professional reflection leads to conversations among teachers about e.g. teaching curriculum, instruction and student development.

4.2 Reflective Dialogue

A reflective dialogue is a conversation wherein two or more colleagues reflect with each other and in which people deeply engage based on experience, data and/or literature (Hord, 2004; Hord et al., 2010; Schaap & Bruijn, 2017; Brown et al., 2017; Brown, 2017). Here lies the opportunity to clarify practice, explain underlying views and, if appropriate, revise these views. It is used to exchange and develop knowledge to enhance understanding and problem-solving. Reflective dialogue is presumably engaged in, because of student learning issues, and as such used to adapt to improve student performance (Lee et al., 2013; Vescio et al., 2008; Katz, O'Donnel & Kay; 2017; Schaap & Bruijn, 2017; Prenger et al., 2017).

There are three aspects upon which reflective dialogue is conducted: (1) experience, (2) data and (3) literature (Hord, 2004; Hord et al., 2010; Schaap & Bruijn, 2017; Brown et al., 2017; Brown, 2017). Experience is considered to be the biggest source on which reflection is initialized (Korthagen & Vasalos, 2005). An experience within a concrete situation often is the starting point from which people reflect. This experience might entail an event that occurred during practice and which is still lingering in the teachers' mind (e.g. a teacher notices that there are still a number of children who seem to have difficulties with some aspect of investigative learning). From Schildkamp et al. (2016) it is apparent that teachers need to combine experience with evidence. Decisions solely based on experience or intuition are not always made well. Here data and literature can be used to inform a decision based on evidence and this can support teacher improvement in order to improve student performance (Schildkamp et al., 2016; Brown et al., 2017; Brown, 2017).

Data can be used as a source for educational decision making, which is called *Data Based Decision Making* (DBDM). Data entails *information that is systematically collected and organized to represent some aspect of schools* (Schildkamp et al., 2016, p.1), e.g. assessment and examination results and student and parent questionnaire data. DBDM is proven effective in improving the functioning of schools in terms of increased student achievement (Van Geel, Keuning, Visscher & Fox, 2016; Schildkamp et al., 2016; Brown et al., 2017). With regard to PLC's the inquiry component of DBDM is crucial as this can improve instruction. The procedure focuses on sharing and discussing opinions with colleagues (Schildkamp et al., 2016). Reflective dialogue fits in this procedure, because central to this is the current way of working and the reasoning why something needs to be done differently (Schildkamp et al., 2016; Brown, 2017; Brown & Flood, 2018).

Studying literature can also be part of reflective dialogue. It can be seen as an activity in which members of a PLC are reading and discussing literature about a subject together (Schaap & Bruijn, 2017). This involves e.g. literature that is typical for education. As the reading of literature is supportive to the gaining of knowledge it is an important source for a PLC. Also professional literature that is provided in the sector of education is always subject to changes in education. It can be considered as a precursor for change or a description of that change. And as such provides teachers with a vast array of available information about their line of work. This supports the development of teachers to be congruent with the development in education. When reading becomes actively processed it is more likely to be learned and transferred to the practice (Thompson, Estabrooks & Degner, 2006).

With regard to reflection in a dialogue, Schön (2017) proposes that reflection-on-action is reflecting when an action has occurred. This allows for a re-visitation of that action to determine how the action is performed (Schön, 2017). Connecting this to PLC's, reflective dialogue is used as a reflecting-on-action as after the practice a reviewing conversation takes place between colleagues.

4.3 Model and structure of Reflective Dialogue

For this study a framework was chosen with regard to a model and questions related to reflection from Korthagen and Vasalos (2005) and a scheme by Pauw, van Lint, Gemmink, Jongstra and Pillen (2017) which provide a division in depth of reflection based on subjects to reflect upon. The model (see *figure 1)* and questions (see *table 1)* from Korthagen and Vasalos (2005) and the scheme (see *table 2)* of Pauw et. al (2017) were adapted and revised to fit this study to describe how reflection could take place.

The adapted model is the ALACT model and it aims to structure reflection. It consists of five phases: (1) Action, (2) Looking back on the action, (3) Awareness of essential aspects, (4) Creating alternative methods of action, and (5) Trial. All the phases are revised to fit within reflective dialogue.

The new model (shown in *figure 1;* adapted from Korthagen & Vasalos, 2005) proposes how PLC's operate in an iterative and cyclic manner with regard to an aspect (experience/data/literature) that initializes reflective dialogue. Thus the model starts with experience/data/literature. Herein these aspects need to be combined within reflective dialogue (Schildkamp et al. 2016). From this point reflective dialogue takes place. It is used to become aware of essential aspects to be able to explain what occurred. Experience/data/literature can also be used as a source to create an alternative method which eventually can be executed in a trial. From here the cycle starts again by a reflective dialogue with regard to the trial.

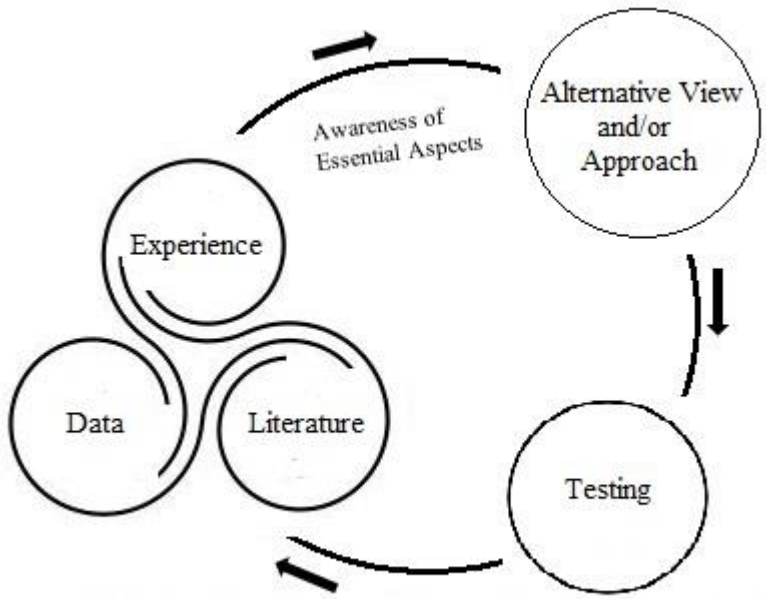

Figure 1: *Model of Reflective Dialogue within the operation of a PLC*

To describe reflective dialogue the following elements that support the structuring of reflection are used for this study. This involves questions (as shown in *table 1;* adapted from Korthagen & Vasalos, 2005) and subjects (as shown in *table 2*; adapted from Pauw et al., 2017) which describe different subjects to reflect upon. Zooming in on reflective dialogue, the questions and subjects are the main elements. Thus, these questions and subjects are used to describe reflective dialogue and therefore represents reflective dialogue when it is present in a PLC meeting.

Table 1: *Twelve Reflective Questions related to Reflective Dialogue*

1. What was the context?
2. What did you want to achieve?
3. What did you do?
4. What were you thinking?
5. How did you feel?
6. What kind of effect did it have on the students?
6a. What did the students want to achieve?
6b. What did the students do?
6c. What were the students thinking?
6d. How did the students feel?
7. What is the ideal situation – The situation the teacher wants to bring about?
8. What are the limiting factors preventing the achievement of the ideal situation?

The scheme of Pauw et al. (2017) provides us with subjects on which reflection can take place. Reflection is based on nine subjects (*see table 2)* which can be used separately to make sense of a context. It is complementing to the twelve questions revised from Korthagen and Vasalos (2005; *see table 1*), because (1) it is applicable to the educational practice and (2) it goes deeper into the context and supports the questions by providing more subjects and examples accordingly to reflect on. These reflective questions and subjects are used to describe reflection and establish whether it is present.

Table 2: *Reflective Subjects to deepen Reflection*

Depth of Reflection	Reflective Subjects				
	Who	Does	What	With Whom	When
Deepening **(Depth level one)**	Teacher; Intern; Student; Determine Identity;	Teaching forms: Instruction; Group Discussion; Groups; Individuals; Manners; Interaction;	Course content: Mathematics; Language; World; Drawing; Etc.;	Student; Colleague; Parent; Etc.;	Importance of time and day Length of time Season
Continued Deepening **(Depth level two)**	Type of Teacher; Teaching Styles	Didactic and Pedagogical problems	Building of the lesson: Structure of method; What is actually happening; Background	Interactional phenomena and problems	

	Where	Which Sources	What Purpose	Why/By What
Deepening **(Depth level one)**	Possible places of action with pros and cons	Learning resource: Method; Book; Whiteboard; ICT; TV; Etc.;	Learning goals and Social goals	Providing Reasons; Pointing out causes;
Continued Deepening **(Depth level two)**		Possibilities and restrictions of learning material	Bringing goals in perspective and interrelate them	Searching Literature about the subject; Comparing authors; Choosing certain motives and supporting this

4.4 The Master Learning and Innovation

The master learning and innovation at the KPZ aims at educating future teacher leaders. These teacher leaders support the school's professional development. Within the master the students must deliver a number of assignment in order to graduate the master. At first they need to do a research assignment by themselves the Individual Practice Research (IPO; individueel praktijk onderzoek). Then the following year the MLI students need to do a collective research assignment the CPO, which stands for collective practice research (collectief praktijk onderzoek). This collective research is going to be conducted in a PLC which is led by the MLI student. It contributes to the professional development of the teacher. The innovation that is going to be designed during the collective research contributes to the improvement of student achievement within a certain area of education (e.g. mathematics). In addition to that they have to do a reflective assignment PRO. In here they reflect on the process of the CPO regarding seven core competences related to the quality and effectiveness of the MLI student as teacher leader.

The CPO consists of three phases according to KPZ. Phase 1 *diagnosis*, phase 2 *design* and phase 3 *evaluation*. Within the phase of diagnosis a problem is being analysed and preferably literature is being searched and used to establish a framework regarding the subject of the CPO. During the phase of *design* this framework is being worked out in a greater extent to eventually being implemented in practice. Then in the *evaluation* phase, the implemented intervention is evaluated in its effectiveness. But, also, its process is being evaluated and here also literature is preferred by KPZ to be used to verify the outcomes of the evaluation. The MLI students use the cycle of collective learning of Castelijns, Koster and Vermeulen (2009) to guide the process of the CPO.

4.5. Research Question and Model

Based on the theoretical framework and the question from KPZ, which involves an in-depth question how certain aspects in a PLC are applied such as reflective dialogue the following overarching research question is provided:

How do PLC's engage in reflective dialogue?

Sub-questions that are related to the main question are:

1) What is the role of experience/data/literature in PLC meetings?
2) In which way are the elements of reflective questions present in PLC meetings?
3) In which way are the elements of reflective subjects present in PLC meetings?

5. Method

Before the current study, KPZ collected both quantitative data based on a questionnaire (Hipp and Huffman, 2010) and qualitative data which consisted of open survey questions about what were considered to be bottlenecks and factors of success in PLC's.
The quantitative questionnaire data in the form of three sub scales (see Appendix I) were used to select four PLC's to be the four cases for this study. This is based on the rating on specific elements corresponding to reflective dialogue.

Qualitative data was collected when the participants were interviewed and their assignments were analysed. In these assignments students reflect on a specific situation that is part of their function as teacher leader. The interviews were conducted in pairs, which consisted of the MLI student and a colleague in the PLC, and were used as deepening of the data that is necessary for answering the research questions of reflective dialogue. Document analysis was used to analyse the assignments. These documents were provided by KPZ with the consent of the participating MLI students. These documents were interpreted to give voice and meaning (Bowen, 2009) to the topic of reflective dialogue. To be able to interpret the content of the interview and documents a coding scheme based on the theoretical framework was used.

5.1 Procedure

To begin the data collection and analyses approval of the Ethical Commission was obtained. Then four respondents were selected to participate. With regard to the selection of the participants, respondents could score 100 points in total on the three 'reflective dialogue' sub scales (see Appendix I) and the top four PLC's with a score of 76; 76; 77,5; 79 and 83 points on a scale of 0 – 100 were selected. To select four PLC's one PLC of the two scoring 76 points needed to be excluded. Here the rating of the PLC is used. One of the PLC's was rated a '7' and the other a '9' out of 10 by the participants. Thus, the PLC with the highest rating score was being selected. These students were approached to ask for their participation. Only two of the originally selected participants were able to participate in the research. Then the respondents with the next highest scores on the sub scales and the PLC rating were approached. It was explained that they would participate in an interview with a colleague and that their assignments would be analysed. One of the participants was not able to refer to a colleague to be interviewed. This resulted in a smaller number of participants than anticipated.

When the students agreed with the participation they were asked to fill in an informed consent. It is emphasized that it would be used and analysed confidentially and has the only purpose for this study to be able to identify aspects of interest to answer the research question. And that the analysing of the document does not have anything to do with the qualification of the assignment. The same is applied for the interview. The respondent names will not be mentioned in the report. The interviews are recorded for the transcription hereof in order for the researcher to be able to analyse the interview. Here, the transcript will only be used for the analysis of the data and can be reviewed by the interviewee once transcribed.

To guarantee quality and validity of the data it is important that the theoretical framework is the basis of the code scheme that is being conducted for the interviews and the document analysis. Also, an inter-rater reliability was calculated. This resulted in a value of $\kappa = 0.781$, which is considered substantial (Sim & Wright, 2005) .

5.2 Respondents

The study was conducted at KPZ and the primary schools. The respondents were selected based on the questionnaire, provided by KPZ. They were students in the Master Leren & Innoveren and were the teacher leaders for their PLC. Next to that one of their colleague teachers at the primary school was invited to participate in a duo interview with the MLI student. For every interview two respondents were interviewed. For one case only one respondent was interviewed. Regarding the four interviews this means that 7 respondents were interviewed related to the four cases. For the document analysis only the assignments (PRO) and research reports (CPO) of the 4 selected students were used.

5.3 Instrumentation

Instruments that were used to collect the qualitative data were the interviews (see Appendix II) and documents, such as the reflection assignment PRO (Professionele Reflectie Opdracht) and the research CPO (Collectief Praktijk Onderzoek). The interview consisted of a semi-structured guideline based on the theoretical framework (e.g. What are reasons to start a conversation during a PLC meeting?; what kind of questions are asked during a conversation?). Room was given for interpretation of answers. In this way the interviewer could react on the interviewee and ask questions not available in the interview, but necessary and complementary to the information provided by the interviewee. For example, when data and/or seem not to take place at all within a particular PLC, questions can be asked to e.g. how do they think that data and/or literature can be supportive in the PLC? The content of the interviews and the documents were analysed based on the theoretical framework. This forms the basis for the code schemes (see Appendix III).

5.4 Data Analysis

The data provided by the interviews and the documents were analysed based on the theoretical framework. This formed the scheme to determine which aspects of reflective dialogue can be found in the interviews and documents. This was done by comparing the answers in the interview and documents with the theoretical framework (e.g. a respondent mentions that questions were asked to one another to explain a situation. This can be linked at asking questions that lead to reflection). An inter-rater reliability was calculated. Another person analysed one of the interviews. This was compared to the analysis of the researcher. For the analysis of the cases the quotes were translated when used in the results. It was intended to triangulate the interviews with the results of the documents in order to provide a more complete picture per case.

6. Results

In this section the results with regard to the interviews and the documents are being discussed. It is divided into four cases to provide an organized view into each particular case with regard to the interview, the reflection assignment PRO and the collective research CPO. At the start of every case an overview will be provided of the PLC with regard to the composition; the division of members, the function of members, the theme and goal of the PLC, the subjects discussed in the PLC, and the (perceived) effectiveness of the intervention designed by the PLC on the performance of students, as background information. The results of the interview and the documents are synthesized and the division will be mentioned by (I) for interview (C) for CPO and (P) for PRO. The phases of KPZ's-PLC's diagnosis, design and evaluation are used as the main structure (see section 6.4, p. 11).

6.1 Case #1

The PLC originated from a work group and had the theme of self-direction of students. The goal of the PLC was to develop an instrument for self-directed learning for the students and to support the teachers in the school to increase the knowledge base and the shared vision of the team e.g.: (C) *"This makes that there is attention for expanding knowledge and the collective vision of the team"*.

The PLC consisted of five members, a preschool teacher, a grade 1 teacher, a grade 1-2 teacher and a grade 4 teacher and one internal mentor (Intern Begeleider, academic coach). Within the research of the MLI student (the main respondent) the focus lies on preschool to grade 1. The reason for the involvement of these specific teachers is that the research was going to be conducted in the lower grades. Therefore the engagement of these teachers was expected to be higher e.g.: (I) "*because, yes, they have to do it"; "Yes, and it that way they might feel more connected to it".* Regarding the effectiveness as to student performance data was gathered for the CPO of the MLI student. Therefore it is used to present this. After the design it seems that the teachers are able to guide the students in the steps of looking forward, keeping track and looking back. Although, a difference is noticed to the extent to which individual students are able to apply the design. The design entails a three-steps-card. The first step is making a plan. It is evaluated by "*I could make a plan".* The second step entails an active part wherein the students are going to work. This is evaluated by for example: "*I worked fine".* The third steps entails evaluation your work, for example: "*It went as I imagined".* It seems to fit grade 1 better: they are more able to work with the three steps, than the preschool grades: they tend to be able to work with step 1 and 2, rather than step 3. It is concluded that the teachers need to be in line with the levels of the individual students. For this collective research, the PLC is facilitated by the school for 20 hours per teacher per year.

There were several subjects of conversation within the PLC, such as: collective learning; the use of knowledge; working from the shared vision and that literature is a reliable source for knowledge to be used and shared; interviews conducted by the MLI student with regard to a problem and a focus; and the context of the school. Within the subjects several activities were being discussed, such as: the questionnaire related to collective learning, design criteria of the intervention, results to draw a conclusion, the literature read by the PLC, and the scheme of collective learning to determine how far they are in the cycle.

6.1.1 Diagnosis

6.1.2 The role of experience, data and literature

In the diagnosis phase the MLI student conducted interviews to determine the problem as experienced by the teachers with regard to self-direction of students and to which extent the teachers contributed to it. Also, a questionnaire regarding the collective learning of the PLC was administered, to establish to which extent collective learning was present. The results were communicated within the PLC. Therefore ***experience*** by the PLC members was input for their conversation in the diagnosis phase, e.g. (C) "*First every member determines the experienced problem for themselves. After exchanging this the PLC discusses the focus of the research"*.

To determine the problem and to establish the focus of the collective research and intervention, data were also collected. The types of data that were collected by the MLI student were interviews, personality questionnaires, questionnaires with teachers and students, and a collective learning questionnaire. These types of data were all discussed within the PLC. Regarding some types of data used by the PLC, some were conducted in the phase of diagnosis as a pre-measurement to be able to compare the start situation with the end situation during the evaluation phase. For example the collective learning questionnaire and the questionnaires with teachers and students. The latter was conducted to gain insight in the current situation regarding self-direction skills. The PLC-members could appreciate the use of data. Especially when the use of it serves the goal. It is mentioned as "*not always leading, but sometimes confirming".*

Scientific literature formed input several times for example (I) "*At a given moment in time I asked them to read some literature (…) the next time we exchanged the literature (…) what did you read, but also, ooh that is also found here and how would they mean that?".* Literature is being used by the PLC to gain knowledge about the subject of self-direction. It is selected by the MLI student for each member of the PLC fitting every member's personal interest. Every member selects a relevant part of the literature provided to them for the focus of the research and shares this with the PLC during a meeting. From the CPO evidence is found that the members of the PLC find reading literature supportive to draw conclusions. They connect what is mentioned by the teachers to the information read.

6.1.3 The element of Reflective Questions

With regard to the conversations that stem from either a subject or an activity several questions were seen within the interview and/or the CPO. The following *table 3* shows how the elements of table 1 were present in the PLC's' conversations in the phase of diagnosis.

Table 3: *Presence of elements of table 1 for Case #1 in the Diagnosis Phase*

Question	Example (I)	Example (C)
1. What was the context?		*Chapter: Introduction*
2. What did you want to achieve?	*What do we want to achieve?*	
8. What are the limiting factors preventing the achievement of the ideal situation?		*Questionnaire operation PLC*

Only the questions about the context (*question 1),* achievement (*question 2),* and limitations (*question 8)* were addressed in the diagnosis phase. The first question, concerned the context and evidence was found within the CPO in the introduction chapter. Here the context in which the intervention would take place was explained and supported by data such as interviews with the teachers. For example which groups would be part of the intervention. Also, within the interview the following example supported this e.g.: "*What would fit for this context to the school?".* This evidence is based on considering the context as to where to focus the intervention upon. This too, can be seen within the CPO's chapter of introduction.

The second question of *achievement* is seen as for this element it is central what the PLC wanted to achieve. In the conversations of the PLC it is considered what they want to achieve by asking themselves this question. This results among others in the establishment of the subject of the intervention. Achievement was also seen within the six steps of collective learning the PLC follows in designing the intervention. The first step is developing ambition, here achievement plays a role as this question supported establishing the ambition of the PLC. An example hereof is that the PLC discussed the earlier findings of the MLI student in the IPO with regard to self-direction. Also, the MLI student collected data, for example the interview, which was being discussed within the PLC and here too, the element of achievement contributed to establishing the ambition and the focus of the PLC.

Question 8 concerned any limiting factors preventing the PLC from being effective. Evidence for it entailed the questionnaire about the operation of the PLC. This was conducted to see which factors of the PLC, for example the perceived extent of shared vision, the extent to which knowledge is used and shared, might influence the process of the collective research and therefore also the design and execution of an intervention. This was being discussed during the PLC meeting to establish which factors to take into account.

In the diagnosis phase the reflective questions appeared to be used to clarify practice, to explain underlying views which can influence the operation of the PLC, and to solve any problems regarding the PLC.

6.1.4 The element of Reflective Subjects

Within the conversations the subjects and elements of *table 2* were either seen in the interview or in the CPO. The following *table 4* shows how the subjects and elements appeared in the phase of diagnosis.

Table 4: *Presence of elements of table 2 for Case #1 in the Diagnosis Phase*

Subjects	Elements Present	Example (I)	Example (C)
Who	Teacher		*Personality types PLC; teacher logs; teacher questionnaires;*
With Whom	Students; Colleagues		*Teacher questionnaires; teacher logs; teacher interviews; conversations with children*
What Purpose	Learning goals		*Chapter Significance of self-direction*
Why / By What	Providing reasons	*"How would that be and what is behind it?"*	

Within the diagnosis phase only the subjects of *who, with whom, what purpose,* and *why/by what* were addressed. Concerning the subject *who,* the teacher for example was taken into consideration by the PLC as to which personality types were present in the PLC. The *personality questionnaire* was part of the conversations in the PLC: "*(…) shows that the PLC represents a manifold of personality traits".* The variation of personality types showed that the research can be analysed from different points of view. Next to that, the teacher was taken into consideration as they were the input for the conversations in the PLC, because they shared their experiences. This was also part of the data that was being collected by the PLC. As these data types were already being discussed, the teacher played a constant role in their experience being input into the data. Therefore, *who* is considered widely by the PLC in a variety of ways.

The subject of *with whom* was taken into consideration in the phase of diagnosis as the PLC was established in order to improve the students' performance regarding their self-direction. With support of literature it was established by the PLC how and why the intervention should benefit the students. Evidence was found within the CPO regarding all the data collected by the PLC regarding the students (*as shown in table 4).* Also, the example in the CPO defined the use of the subject *with whom* during the phase of diagnosis as this chapter provided the significance of self-direction in students.

The purpose was being discussed during the PLC meetings when they were establishing the subject of their PLC. Also by reading literature about self-direction the purpose of this aspect in student learning was brought into perspective. This could be seen within the CPO's chapter of the significance of self-direction. Here the purpose of this intervention became clear. This was according to the phase in the collective learning cycle of developing ambition. This was collectively done with the PLC.

Evidence was found regarding the element of *providing reasons*. The interview and PRO provided us with the following example, which can be seen in *table 4.* But, this referred to the operation of the PLC as this was being discussed during the looking back in the PLC meeting on the study day. During the PLC meeting something had happened which resulted into this reasoning. The CPO offered multiple examples where reasons are provided, for example: "*It appears that only two colleagues have read something, with as reason lack of time"* and *"On the basis of (…) the PLC reasons which goal the design has and which factors might influence this".*

In the diagnosis phase, the reflective subjects appeared to be used to clarify practice, explain underlying views, share knowledge for further development and to solve problems.

6.1.5 From Diagnosis to Design

6.1.6 The role of experience, data and literature

When transitioning from the diagnosis to the design phase, the role of experience, data and literature were seen in different ways. Evidence from the interview showed that in both of the phases experience, data and literature were intertwined as it was used in the same conversation several times. For example, ***data*** that were collected and formed the input of the conversation and that ***experience*** with self-direction was used to analyse the data e.g.: *"What is your experience with regard to self-direction?".* With regard to ***literature*** and experience it adds to the previous quote that books and literature about self-direction were used to support the PLC in shaping their design. Literature and data were also used at the same time according to the following quote: (I) "*The design criteria, how is it linked to the questionnaires and the conversation about that".*

Adding to that is that literature is especially highly appreciated by the MLI student. Regarding the other members of the team, they had to gradually get accustomed to reading and using literature. Within the interview and CPO the use of literature was seen when the MLI student provides the PLC with several articles to read in advance. At first this was done with all the teachers of the school. Here the MLI student found that not everyone was engaged in reading the provided literature. Gradually it became more and more appreciated by the PLC-members and when in the beginning the MLI student needed to provide them with literature, some of the members became to search and share literature by themselves e.g.: (C) *"The PLC sees added value in reading, because with the acquisition of new knowledge a more founded opinion can arise".*

Next to that the CPO provided evidence that literature was used to provide reasons for which goal the PLC has in mind for the design. This was done when gathering information about the subject in the phase of diagnosis, but which were used during the phase of design. Also, the PLC established in the diagnosis phase which factors might be influential to the process of the design.

6.1.7 The element of Reflective Questions

Here the element of reflective questions which were seen within the transition from the phase of diagnosis to design were being discussed.

Table 3.1: *Presence of elements of table 1 for Case #1 transitioning from Diagnosis to Design*

Question	Example (I)	Example (C)
7. What is the ideal situation?	*If we are going to take action, what do you imagine it would look like?*	*Design Criteria*

In this transition phase, only the element of an ideal situation (*question 7)* was addressed. Considering this element of ideal situation evidence was found within the interview (*see table 3.1).* Here within the conversations of the PLC this element was discussed. The CPO provides an example within the criteria for the design. The criteria mention what the intervention should look like and this refers to the ideal situation.

6.1.8 Design

6.1.9 The role of experience, data and literature

Within the phase of design the pre-existing and/or gained ***experience*** of the teacher regarding education and/or the subject was found as being the support for the conversation in designing an approach, e.g.: (I) "*The last time we did this and this and then the next step: Are there any ideas with regard to that?".*

It seems from the interview that data was not used as support for designing a new approach within the PLC. Yet, the CPO provides evidence of ***data*** for example the logbooks, conversations with the teachers and the children as input for the design phase. The findings hereof were discussed within the PLC in the meantime. This contributed to the design, as they were able to respond to the findings when designing the intervention. The conversations were held by the MLI student to gain insight in the continuation of the intervention process. Within the design phase it was used to establish how the intervention is executed and how the use of the design was ***experienced*** by the teachers. This was done by the PLC to be able to react on these experiences with the execution of the design during the process, for example (C) to decide to use another design of the step cards.

When following up with ***literature*** it was seen as being input for the conversation and also as support in the design phase for example in designing an approach. The PLC used several types of literature, such as didactic coaching and active learning with children. These books for example provided them with various examples of questions they could ask with regard to self-direction. It also provided a structure for students how to design their play and offers guidelines to which it could comply. Within the interview the following quote also showed that literature was used to support an approach e.g.: (I) "*Yes, so you say now we interpreted the information and now it is times to act on it".*

6.1.10 The elements of Reflective Questions

Table 3.2: *Presence of elements of table 1 for Case #1 in the Design Phase*

Question	Example (I)	Example (C)
3. What did you do?	*"The last time we did this and this".*	*Teacher questionnaire; Conversations with the teachers*
4. What were you thinking?		
5. How did you feel?		
6. What kind of effect did it have on the students?		*Conversations with students and teachers; logbooks*
6a. What did the students want to achieve?		
6b. What did the students do?		
6c. What were the students thinking?		
6d. How did the students feel?		

Within the phase of design the questions about teacher's actions (*question 3)*, thoughts (*question 4)*, feelings (*question 5)* and the students (*question 6 to 6d)* were addressed. The element of what did you do (*question 3)* was seen within the interview. Here within the PLC meetings it was discussed what they did the last time they met. This element was also considered within the CPO in the teacher questionnaire and conversations. This was gathered by the MLI student and part of the conversation during the PLC meetings. Here the actions of the teachers were taken into consideration as they needed to answer a question such as, e.g. (C): "*Do you explain the children why they are going to do a particular assignment?"*. The conversations were held to give feedback on the design during the process of designing the intervention. Therefore it is considered that the actions of the teachers in practice were used in the conversations of the PLC.

The element of the teacher's thinking and feeling were not explicitly mentioned by the interviewee. Yet, the interviewer prompted the question whether this was present e.g.: *When you are discussing an activity, are you considering your thoughts during the activity, or your opinion as to the activity?",* and the interviewee answered e.g. "*Yes, we do!",* and provided an example of a conversation in the PLC e.g. "*for example the mentioning at the convention".* Here the opinion and feelings toward for example the subject of the intervention or its design of the whole school team were expressed and input into the conversation in the next PLC meeting. No further evidence was found in either the CPO or PRO regarding these elements.

The elements regarding the students appeared to be part of the conversations during the design phase. From the CPO it appeared that weekly conversations with the children were held. These conversations aimed at getting the children to think about the steps they had to make and were used as feedback while designing for example the step cards which the students will use for directing themselves. The logbooks, too, formed input into the conversations of the PLC according to the CPO. The logbooks were used to identify for example what the students did during the execution of the design. Finally, for example conversations with the teachers also were about the students. Within the design phase this was used to give feedback on the continuing process of the intervention also regarding the students. Thus, it appears that this was part of the conversations in the PLC as well.

The reflective questions appeared to be used to clarify the practice while executing the design, and explain the underlying views regarding the design, to share knowledge about the execution of the design with each other and to respond to occurring problems and solving this.

6.1.11 The element of Reflective Subjects

Table 4.1: *Presence of elements of table 2 for Case #1 in the Design Phase*

Subjects	Elements Present	Example (C)
Who	Teacher	*Teacher logs; teacher questionnaires;*
Does	Teaching forms	*Design Criteria;*
What	Play/Work time; Mathematics	*Chapter Starting points of the innovation; Design Criteria; "Cooperative workgroups are deployed in all groups in the current situation*
With Whom	Students	*Teacher questionnaires; conversations with children*
When	Importance of time of day	*Design Criteria*
Where	Possible places of action with pros and cons	*Design Criteria*
Which Sources	Materials	*Design Criteria*

Within the design phase the elements *who, does, what, when, with whom, where* and *which sources* were addressed. *Who* concerns the teacher. Within this phase the teachers were part of the conversations as they were the executioners of the intervention design. Throughout this phase they were also subjects regarding their experiences with the design.

The element of *does* was taken into consideration by the PLC during their meetings. For example with regard to the teaching form. This was particularly seen in the CPO as to how to implement and support self-direction in the play/work plan of the students, especially within the design criteria of the intervention. Here the teacher was provided with a collection of actions, for example (C): "*The teacher questions the children about how they can approach the task ahead"*.

The element of *what* was seen in particular within the design criteria. This is complementing to the element of *when.* Within this element time was taken into consideration. Here it was mentioned that the design was going to be deployed during the play/work time (*when)* of the preschool students and during the mathematic lesson (*what)* of grade 1 students. This was done based on the feasibility of the innovation.

With whom is addressed throughout the process of designing the intervention for example by conversations with the children. These conversations were aimed to establish students' thinking during the execution of the intervention. Furthermore, the students were part of the conversation in the PLC as the conversations with the children were discussed during the PLC meetings.

With regard to the elements of, *where* and *which sources*, the CPO provided evidence in the design of the innovation. *Where* for example was seen within the choice to deploy the innovation in the preschool grades and grade 1, because of the feasibility of the innovation. During the design further expansion to the upper grades was taken into consideration as well. This was seen within the conditions for the design in the CPO. *Which sources* was found in the "object design". Here several models were put available in order for children to direct themselves. Subsequently the design was providing materials, for example, the step card with pictures for the students and a step card for the teachers.

Furthermore, the *design criteria* were discussed within the PLC. This was found when the PLC wanted to link the design criteria from the literature to the questionnaires that were collected by the PLC. Within the CPO document it was many times mentioned that every part of the collective research was discussed within the PLC. Even though it was not always mentioned explicitly in the interview. Within the design criteria the importance of time e.g. when to carry out the research *"the PLC discusses this and put this next to the year planning"*, possible places of action e.g. in which grades the research was going to be carried out "*the PLC decides to carry out the research from preschool to grade 1"*, the method e.g. which method was going to be used to enable self-direction, and the learning goals e.g. what is this going to look like, were presented.

In this phase the reflective subjects appeared to be used to explain underlying views, for example to explain which grades were selected and/or to explain the criteria to which the intervention was designed, and to solve any problems occurring during the execution of the intervention.

6.1.12 Evaluation

6.1.13 The role of experience, data and literature

The role of experience seemed to play different roles within the evaluation phase. Almost all of the systematically gathered data for the evaluation was based on the ***experience*** of the teachers with the execution of the intervention design and the experience of the students with it. For example, the experience of teachers were input in answering the questions. The PLC compared and evaluated the data with each other. Therefore, the experience of the PLC members also played a role in the evaluation phase. Here the members gave meaning to the data and interpreted it by the knowledge they had with or gained with regard to the subject of self-direction during the intervention process. Also, experience played a part with regard to the collective learning of the PLC itself. When collecting data about the extent to which collective learning was present, the experience of the members with it was conducted. Likewise, when evaluating the results of the data within the PLC meeting. For example: "*The PLC indicates that during the research process more self-direction regarding the PLC members is experienced.* It was also related to the explanation by the PLC members for the role of the MLI student from a guiding one to a more supporting role in the research process. The PLC members for example expected this to have happened because of the inexperience of the other PLC members with research.

Successively, within the phase of evaluation ***data*** played an important role as this was used by the MLI student and the PLC to establish whether their intervention had been implemented successfully. And to see if it had contributed to an increase in student performance. Thus, whether the students benefited from the intervention. Data that was gathered regarding the performance of students was for example used to draw a conclusion about "*how is it possible that the preschool grade is so much more advanced than grade 1?"*. From the CPO evidence was found for types of data that were used during the evaluation phase and that these were all part of the PLC meetings. The data consisted of a logbook tracked by the teachers, conversations with the teachers, weekly conversations with the children, and a questionnaire regarding teacher and student behaviour. The data used during the evaluation phase had the intention to determine the experience with the design process and to use in future implications in the use of the design after the intervention period.

The logbooks were used at every thinking step of the design to establish what works well and less for the students in the support of getting the students to think for their own. In this way the experiences of the teachers were systematically recorded in order to clarify strong and weak points in the intervention design.

The conversations with the teachers contributed to the feedback on the design process and how it can be used in the future. The students' conversations were used to stimulate the students to think about their actions and how they will approach it the next time. The steps of the design, looking forward, keeping up and looking back were discussed. Furthermore, attention was provided to how the students experienced their freedom of choice and to which extent this contributed to the intrinsic motivation of a student.

The last data type, the questionnaire regarding teacher and student behaviour was conducted to measure the change in knowledge, skills and attitude in teachers. It was used regarding the students to gain insight to the extent to which the students were able to direct themselves during the making of their play/work plan.

Regarding the use of literature in the PLC meetings during the phase of evaluation no evidence was found in either the interview or the CPO. Yet, within the CPO's chapter of evaluation, literature is suggested by the MLI student to explain for example why some of the students not yet possess the ability to think about their actions.

6.1.14 The element of Reflective Questions

Table 3.3: *Presence of elements of table 1 for Case #1 in the Evaluation Phase*

Question	Example (I)	Example (C)
6. What kind of effect did it have on the students?		*Conversations with children; logbooks; questionnaire teacher behaviour and student behaviour*
6a. What did the students want to achieve?		
6b. What did the students do?		
6c. What were the students thinking?		
6d. How did the students feel?		
8. What are the limiting factors preventing the achievement of the ideal situation?	*How could that be that preschool is performing better than grade 1?*	

In the evaluation phase the elements of students (*question 6 to 6d)* and limiting factors (*question 8)* were addressed. Although the students were not mentioned in the interview, evidence of it was found within the CPO. The MLI student held conversations with the children, asked the teachers to keep up a logbook, and to answer a questionnaire with regard to e.g. the actions of the children. In that sense it appeared from the CPO that the students were involved by the PLC. The PLC wanted to see which effect the design had on the children for example e.g. (C): "*What worked in order to get children to think?".* Also within the teacher logbooks there was attention for what the students did e.g. (C): "*The children signed off on their step card before continuing to the next step".* As these were part of the data collected by the MLI student and as this formed input for the conversation within the PLC meeting it appeared that it was discussed. Yet, from either the interview or the CPO it was not clear whether the data that was gathered concerning the students were part of the conversations during the PLC meetings with exception of the meeting wherein the evaluation took place.

For the last element of limiting factors (*question 8)* evidence was found. The example of the interview in *table 3.2* referred to the PLC taking into consideration that the execution of their intervention had a different effect between the groups wherein the design was executed. Here they wanted to see what limited grade 1 to perform in the same manner as the preschool grade. This element was also found within the logbooks of the teachers as a question herein related to limitation e.g. (C): "*What did the children consider to be difficult?"*.

In the evaluation phase the reflective questions appeared to be used to clarify practice, i.e.: what effect does the intervention currently have on the performance of the students regarding to the intervention subject? The questions were also used to exchange the knowledge gathered about the execution of the intervention and its effectiveness in order to develop the intervention further to be able to improve student learning even more.

6.1.15 The element of Reflective Subjects

Table 4.2 : *Presence of elements of table 2 for Case #1 in the Evaluation Phase*

Subjects	Elements Present	Example (C)
Who	Teacher	*Personality types PLC; teacher logs; teacher questionnaires;*
With Whom	Students; Colleagues	*Teacher questionnaires; conversations with children*

In the evaluation phase evidence was found for the elements of *who* and *with whom* to be addressed. Regarding *who* evidence was found as also being part of the evaluation phase and as such being discussed within the PLC meeting. Overall the teachers as members of the PLC were executioners for the intervention design and were also participants in gathering data. This data was eventually used to evaluate. The role of the teachers in gathering data was twofold. On the one hand they gathered data with regard to the students. For example the logbooks, in which the teachers' actions and the effect it had on the children was recorded. On the other hand data was gathered regarding the teachers themselves for example the teacher behaviour questionnaire.

This is complementary to the element of *with whom*, for which evidence was found within the CPO. As the teachers were also participants in gathering the data they were also considered as executing the intervention design. The data gathered by them and regarding them were input into the conversation during the PLC meetings where the evaluation took place. The students were also considered by this element in the phase of evaluation. Within this phase it was determined what effect the intervention eventually had on the students.

The reflective subjects appeared to be more practical in the evaluation phase as these were all part of the gathered data and thus related to the applied practice. Although the data was eventually used to clarify practice and explain underlying views regarding the intervention, the reflective subjects were not used directly in that sense.

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6.2 Case #2

This PLC was established for the CPO of the MLI student. It consisted of 5 members from grade 1 to grade 6. These members were designing the intervention and doing the collective research. Three of the five members were actually executing the design. The director of the school was the sixth member of the PLC, but did not participate in the PLC's designing and executing the intervention, but was deployed in gathering data by flash visits. The PLC members were chosen based on a test that shows different personalities. The theme of the PLC was the improvement of differentiation in mathematics. The goal was to determine the effect of pre-teaching on self-esteem, pleasure and engagement of the students for mathematics. The evaluation results (based on the gathered data such as: logbooks, questionnaires, flash visits and student focus group) showed that the teachers and students were satisfied about the deployment of pre-teaching during mathematics and that it presumably contributed to the pleasure, self-esteem and engagement during the mathematic lessons according to the CPO.

The topics that were discussed in this particular PLC were that of differentiation in mathematics, video footage, student opinions, and theory. Activities that were being discussed were related to pre-research for example "*how are we doing now"* and the executive phase of the research, for example the mathematic lesson and the video footage.

6.2.1 Diagnosis

6.2.2 The role of experience, data and literature

Experience appeared to be present as shown in the introduction part of the CPO. The reason for the collective research with regard to mathematics was: "*The teachers at (…) have the feeling that there is little engagement with regard to the mathematic discipline".* However, the reason for the subject was determined with the whole school in advance of the establishment of the PLC.

After establishing the ambition of the school, the PLC was established based on the Belbin test for personalities (Spin, 2016). Here was where the phase of diagnosis started. In this phase ***experience*** appeared to play a role. An example from the CPO was that the teachers experienced the difficulty to meet the different needs of the individual students. During this phase scientific ***literature*** played a very important role. From the CPO literature was used to gain knowledge about the subject of mathematics itself, for example the mathematical attitude, the significance of differentiation in the mathematic education, what differentiated instruction looks like, which skills teachers need for differentiated instruction, and finally how self-esteem, pleasure and engagement related to mathematics. Literature served the purpose of familiarizing the PLC members with the subject of differentiated mathematics in order to prepare for designing the intervention of pre-teaching in mathematics. This was all part of the discussion during the PLC meetings. Here the experience of the teachers with the current mathematic lesson and the provided literature was compared. Therefore, the conversations within the PLC during the diagnosis phase consisted of experience and literature.

Data was also used in the phase of diagnosis. From the CPO it appeared that video footage has been used to observe how differentiation was currently applied in the mathematic lessons. This showed to be input for the conversations in the PLC e.g.: "*We saw the video footage, what did you see?"*. It was mentioned that video footage contributed to what was done during a mathematic lessons as experienced by the teacher and how it is interpreted by the PLC-members e.g.: "*Teachers can make it more beautiful than what you actually see in the footage".* As such, it was also used to indicate a particular situation, which was discussed in the PLC meeting. Another form of data was the "silent dialogue". It entailed writing down answers concerning a question individually on for example a post it, which was afterwards discussed. This was deployed to gain insight in the needs of the teachers in order to differentiate. Also, the general attitude of the students were measured by using a questionnaire. These types of data were all discussed outside of the PLC, but also again during the

PLC meetings. They were used to establish a start situation and to establish what was needed for the teachers to be able to differentiate their mathematics lesson, for example which knowledge, skills and/or attitudes were related to effective differentiation. Therefore it was considered to be input for the conversations of the PLC and as this was done in advance to the design phase it was part of the diagnosis phase.

Experience, data and literature were used as support in designing an alternative method to which the current mathematics lessons were executed. Data was appreciated by the PLC as it provides one with an objective image, but it was not experienced as something that is used solely e.g.: "*So, you cannot do without, but you also cannot do it solely with data".*

6.2.3 The elements of Reflective Questions

The following *table 5* shows how the elements of table 1 were present in the PLC's' conversations in the phase of diagnosis.

Table 5: *Presence of elements of table 1 for Case #2 in the Diagnosis Phase*

Questions	Example (I)	Example (C)
1. What was the context?		*1.3 Reason and Practical Problem*
2. What did you want to achieve?	*The goal is to see which effect pre-teaching has on the self-esteem, pleasure and engagement of the children*	
7. What is the ideal situation?	*What should differentiation look like?*	

In the diagnosis phase the elements of context (*question 1),* achievement (*question 2),* and ideal situation (*question 7)* were addressed. The context (*question 1)* in which the mathematic lesson took place was not being discussed during the PLC meeting. This refers to the context in which the mathematic lesson was provided. Therefore the context to which the pre-teaching was done was not discussed during the PLC meeting as it was implemented in the existing mathematic lesson. However, the mathematic lessons played an important part in establishing the focus of the research and the intervention and as such it was discussed in the PLC.

The element of what did you want to achieve (*question 2)* was mentioned in the interview answering the question of what goal the PLC had. It was seen in the CPO in such a way that herein the determination was mentioned to what the teacher wanted to achieve every time they pre-teach students.

The element of ideal situation (*question 7)* was seen within the interview as *table 5* shows in the phase of diagnosis. But, evidence for this element was also found within the CPO. The PLC considered collectively, based on literature and experience, what the ideal differentiated mathematic lesson should look like and complementary to that what the pre-teaching should look like.

The reflective questions appeared to be used to clarify practice and explain underlying views in the phase of diagnosis.

6.2.4 The element s of Reflective Subjects

Within the conversations the subjects and elements of *table 2* were either seen in the interview or in the CPO. The following *table 6* shows how the subjects and elements appeared in the phase of diagnosis.

Table 6: *Presence of elements of table 2 for Case #2 in the Diagnosis Phase*

Subjects	Elements Present	Example (I)	Example (C)
Who	Teacher		*Personality types PLC*
What	Mathematics		*The subject of the research*
With Whom	Students		*Teacher logs; focus group with children; student questionnaire*
When	The importance of time		*Implementation design*
Where	Possible places of action with pros and cons		*Implementation design*

In the diagnosis phase the subjects of *who, what, with whom, when* and *where* were addressed. The element of *who* referred to the teachers that were members of the PLC. As the development of the ambition was established with everyone in the school a personality questionnaire was conducted to establish which personalities were present in the school. From the CPO evidence was found that the types of personalities whom fitted the PLC best were recruited in the PLC as members.

Regarding the element of *what*, evidence was found in the interview in the form of mentioning mathematics in the theme and goal of the PLC. This was already somewhat established in developing the ambition, but it was more specifically defined within the conversations of the PLC. Mathematics was also seen as the element of *what* as this was the main subject of the research.

The element of *with whom* considered the students in their conversations in the phase of the diagnosis as appeared in the CPO. In the introduction and particularly in the reason and practical problem the students were mentioned. This was all part of the diagnosis phase as here the effect the existing form of differentiation of the students was taken into account. This was for example regarding the pleasure and especially engagement of the students. Thus, the element of students in the subject of *with whom* was part of the conversations as they were the ones who received the (further) differentiated instruction.

Also, conversations were for example held with regard to the design criteria and also how the design was going to be implemented. These conversations were held to establish the design criteria based on literature. By establishing the implementation design the moment and place of pre-teaching was opted for and as such the subject of *when* and *where* appeared e.g. "*The teacher provides pre-teaching to the less performing mathematic students during every mathematic lesson".*

Within this phase the reflective subjects appeared to be used in both a practical and reflective way. On the one hand it was practically used to determine which teachers were recruited. On the other hand it was used to clarify practice, explain underlying views as to the current mathematic lesson and what differentiation should look like. Here knowledge gained about this subject was being shared in order to solve the existing problem with the mathematic lesson to improve student learning.

6.2.5 Design

6.2.6 The role of experience, data and literature

During the phase of design ***experience*** was considered, for example sharing knowledge between the PLC members and how they experienced an instructional element to work well or not. Also, the MLI student and the PLC-members as well sometimes experienced something which needed to be discussed e.g.: "*Oh, this is something I need to talk about and I noticed otherwise that there was something bothering them during the execution and that this was being discussed".* Experience within the classroom with regard to the execution of the design was also input of the conversation in the PLC. Here several experiences were forwarded and a solution was taken. This was supported by ***literature***, as this provided them with the framework for their design. Sometimes this experience was discussed outside of the PLC meetings, but these were transferred to the other members of the PLC during a meeting. The experience with regard to a successful element is support for their design of differentiation in mathematics and also for trying out a different method of action which is evaluated in the next PLC meeting.

More evidence was found with regard to literature to be part of the design phase as well. It has shown to be input and support as well for this PLC. The entire design of the differentiated mathematic lesson was based on theory. This literature was provided by the MLI student. It was mentioned in the interview that it is not very common for an elementary school teacher to come in contact with scientific literature. Though, literature in the form of professional magazines were made available to the teachers of the school. But, then again, a teacher needed to run into the subject of differentiation to read something about it. Thus, it is stated that the literature in this PLC is scientific of nature. For example literature about the model of collective learning, a model of what differentiation could look like and the conditions to which the design should be shaped. Likewise, literature was supporting another method of action as for example when the execution of the design was done differently and it was evaluated during a PLC meeting how it should have been executed based on the literature**.** It was also used to explain a situation, this was seen in e.g.: "*Yes, we are now in the phase of taking action of collective learning. So now we are going to take a look whether we connected all the consequences. Then we will go to the next phase and the planning looks like this and this".* Literature was not used in the entire process of the PLC, but mainly at the beginning as it was the starting point from which the design began. Then the teachers' ***experience*** regarding for example mathematic education took over and the rest of the process is then more based on each other's experience**.**

In this case it was shown for experience, data and literature to be intertwined. ***Experience, data*** and ***literature*** formed input for the conversation independently but also simultaneously. As for example data such as the video footage was input for the conversation, but at the same time the experience of the teacher with regard to the lesson was input for the conversation. Then literature was used to explain how the performance should have taken place. As such, literature, data and experience were used simultaneously as input for the conversation. Literature and experience both formed input and support as well. The use of literature diminished gradually as the CPO proceeded and instead experience became more input and support.

6.2.7 The elements of Reflective Questions

Table 5.1: *Presence of elements of table 1 for Case #2 in the Design Phase*

Questions	Example (I)	Example (C)
3. What did you do?	*"What has been your role?"*	
4. What were you thinking?	*And also, what do I think about it?*	
5. How did you feel?	*It was more based on feeling.*	
6. What kind of effect did it have on the students?		
6a. What did the students want to achieve?		
6b. What did the students do?	*"I see that this child is being absent in his attention"*	
6c. What were the students thinking?	*"During the PLC meetings we interpreted what the students might have been thinking"*	
6d. How did the students feel?		
7. What is the ideal situation?	*How should differentiation look like?*	*Design Criteria*
8. What are the limiting factors preventing the achievement of the ideal situation?	*This is not how we thought of it to be done. Are we experiencing the same in our grades? How can this be solved?*	

The elements of teacher actions (*question 3),* thinking (*question 4),* feeling (*question 5),* students (*question 6b, and 6c),* and ideal situation (*question 7)* were seen within the interview for the phase of design. The example provided in *table 5.1* regarding the element of what did you do is related to the role the teacher played during the mathematic lesson. It related to the action(s) of the teacher. This was discussed during the PLC meetings.

Another example was the element of thinking (*question 4).* This was discussed during the phase of design when executing the intervention. It related to the sharing of thoughts with each other about something that had occurred. The element of feeling (*question 5)* was not directly mentioned in the interview, but it was related to how a choice was made for example which student was selected for the pre-teaching.

Regarding the element of students (*question 6 to 6d)* evidence was found within the interview for the phase of diagnosis. Within the interview examples were provided which can be seen in *table 5.* Here not every question related to the students is particularly seen within the interview. For example, the element of effect (*question 6),* achievement (*question 6a),* and feeling (*question 6d)* were not seen directly in the interview. And for the remaining elements of student actions (*question 6b)* and thoughts (*question 6c)* it needs to be mentioned that these questions are mostly interpreted by the teacher and the PLC members e.g.: "*Thus, it was actually based on interpretation".*

The element of ideal situation (*question 7)* was already seen within the diagnosis phase. Evidence was also found for it in the phase of design. After establishing how pre-teaching should look like it was configured during the design of the intervention and can therefore also be seen within the design criteria of the intervention. The design criteria were established in accordance with the PLC members during a meeting and are therefore considered to be part of the PLC's conversations.

The final question what are the limiting factors *(question 8),* was part of the conversations as it was subject to the conversations within the PLC meetings. Evidence for it is found within the interview (*see table 5.2*). For example, the PLC members discussed their mathematic lesson and what they experienced during such a lesson and mentioned for example: "*Hey, it did not go like I wanted or it did not go very fantastic"*. This was part of the design phase as the intervention was executed while (re)designing the intervention.

An important note regarding these elements is that when executing the intervention these elements were not only discussed during the PLC meetings. They were also already discussed after a mathematic lesson between the PLC members in an informal setting for example the school yard or

the hallways e.g.: "*Yes exactly, and already in the hallways. It is not per se for the whole setting, but also when someone just had their mathematic lesson and we were outside in the schoolyard: Hey, it did not go like I wanted or it did not go very good".*

In the design phase the reflective questions appeared to be used to clarify practice e.g. in what way the pre-teaching was used by the teachers and discussed this in the PLC meeting where the underlying views regarding the practice were explained. These were for example used to solve a problem that occurred the pre-teaching.

6.2.8 The elements of Reflective Subjects

Table 6.1: *Presence of elements of table 2 in Case #2 in the Design Phase*

Subjects	Elements Present	Example (I)	Example (C)
Who	Teacher		*Personality types PLC; teacher logs; flash visit*
Does	Teaching forms; individuals		*Design criteria; teacher logs; focus group with children*
What	Mathematics		*The subject of the research*
With Whom	Students		*Teacher logs; focus group with children; student questionnaire*
Which Sources	Method and Material		*Design Criteria*
What Purpose	Learning goals		*Design Criteria; Implementation design*
Why / By What	Providing reasons	*(I) What is behind the suggestion that a student is always weak in mathematics?*	

In the design phase it appeared that all the reflective subjects, except *when* and *where* were addressed in the PLC. For example the subject of *who* with regard to the teachers was part of the PLC meetings as they were the developers and executioners of the intervention during this phase. Three of the five PLC members took part in the execution of the design in pre-teaching students who perform less in mathematics than others. Their experiences regarding the design and the execution of it were several times input in the conversations between PLC members inside and outside of the PLC meetings. As such, the subject of *does* and its element of teaching form was part of the conversations in the PLC as well. Thus, on the one hand the teachers were designers and analysers of the data and on the other hand the teachers were designers, executioners and analysers.

With whom, and its element of students were part of the conversations in the PLC as during the development of the design they were constantly held in mind as they were the ones who will receive the differentiated instruction's pre-teaching. From the interview an example is provided as that during the design and execution of the conversations were more about "how do you make choices?" and "what effect does it have on the students?".

Also, conversations are held with regard to the design criteria and also how the design is going to be implemented. This started in the diagnosis phase, but is also part of the design phase as it is further expanded. During the execution of the design it underwent slight changes in an approach of how to execute the intervention e.g. (I): "*The next time you can handle it like that or this".* This was sometimes discussed one on one, but it was always transferred to the PLC e.g. (I): "*Well, we had this conversations and we extracted these tips. How do you see that, are you going to that as well, or do you not experience that at all?".*

Regarding the subject *what purpose* the CPO provided evidence that the learning goals were opted for in the PLC when the teachers divided their class based on their *learning goals* and the *test results* and this was discussed. Successively the following subject *by what* was seen in the interview as the PLC also provided reasons for why a particular student was chosen to participate in the pre-teaching (for an example *see table 6.1).*

Here the reflective subjects were used in two ways. On the one hand they were used to clarify practice regarding the execution of the design by the experience the executing PLC members have with it. It was also used to explain underlying views as to the execution of the design and to solve problems that were experienced by the teachers. On the other hand it was used in a practical way as the subjects also refer to the criteria of the design and thus what the intervention was going to look like.

6.2.10 Evaluation

6.2.11 The role of experience, data and literature

The role of ***data*** was considered very important in this phase. Most of the data, such as the logbooks, flash visits, student questionnaire, and conversations with teachers and students were gathered during the process of the CPO. It was aimed at providing results regarding the operation of the intervention and to establish the effect it had on the pleasure, self-esteem and engagement in students. The other types of data were used during the phase of diagnosis (see section 6.2.2, p. 24).

The logbooks were specifically used to measure the operation of the design. The completed logbooks were subject of a group conversation between the executing teachers and the other PLC members. This conversation based on the logbooks were used to provide clarification regarding the findings of the executing teacher regarding the intervention with the other members.

The flash visits, student questionnaire and group conversation with the students were used to measure the added value of the design. The flash visits offered insight into the structure, content and guidance during the pre-teaching and classical instruction. The questionnaire provided insight into the pleasure, self-esteem and engagement of all the students during the mathematic lessons. The conversation with the students were used to express the experiences of the students with the design.

Regarding ***experience*** evidence was found for the evaluation phase. It was used in two different ways. On the one hand it was used as input while gathering data. The experience of the teacher during the execution of the pre-teaching was recorded. This consisted of what they experienced regarding for example their own actions and the effect it had on their students e.g. (C): "*What was the effect of pre-teaching on the students who find mathematics difficult?".* On the other hand, while discussing the results of the evaluation within the PLC the experience of the PLC members were applied. This experience consisted of experience with pre-teaching and the knowledge they gained about the subject during the diagnosis phase. This was used to interpret the results and give meaning to it. Thus, experience and data were combined.

Little to no evidence was found with regard to ***literature*** as being part of the evaluation phase. What was mentioned about literature in relation to evaluating was found in the interview e.g.: "*Literature has actually been our starting point in devising this. After that literature was used, but not much new literature. In the beginning it was more based on literature and then more and more on experience".* As such, the role of literature seemed to diminish during the entire process and no further evidence was found that literature is used during the PLC. The CPO only provided evidence that the MLI student used literature in the conclusion of the CPO. Yet, it has neither become clear whether literature was used in this phase within the context of the PLC.

6.2.12 The element of Reflective Questions

Table 5.2: *Presence of elements of table 1 for Case #2 in the Evaluation Phase*

Questions	Example (C)
3. What did you do?	*What did you do during the pre-teaching?*
6. What kind of effect did it have on the students?	*What was the effect of the pre-teaching on the students?*
6a. What did the students want to achieve?	*Focus group with the students; questionnaire students*
6b. What did the students do?	*What did the rest of the class do during the pre-teaching?*
6c. What were the students thinking?	*Focus group with the children to measure their experience with the pre-teaching; questionnaire students*
6d. How did the students feel?	*Focus group with the children to measure their experience with the pre-teaching; questionnaire children*

In the evaluation phase the elements of teacher actions (*question 3)*, and the students (*question 6 to 6d)* were addressed. Regarding the element of teacher actions the angle of approach differed from the design phase in the evaluation phase. Here the logbooks, conversations with the teachers and the flash visits by the director were used to establish the actions of the teachers during the mathematic lessons. These were all part of the conversations of the PLC as they were evaluating the process and product together. Examples can be found in *table 5.2*.

The elements of students (*question 6 to 6d)* were part of the conversations in the PLC meeting. These elements were taken into consideration by the PLC as, for one, questionnaires were conducted with the students. Here the notion of what the student wanted to achieve was seen within the question in the questionnaire e.g.: "*I will succeed in achieving my goals for mathematics".* The other question of what did the students do was exemplified by the following question e.g.: "*I cannot start after the teacher's explanation, I still have too many questions".* With regard to the element of students' thinking it was also seen within the questionnaire provided in the CPO. It was seen within, for example, the question which considered "*During the mathematic lesson then I come to think about how much I enjoy mathematics".* The notion of students' feelings was also captured within the questionnaire. This was seen in how they felt during the mathematic lessons. For example that they felt that the lessons were boring, fun to do, or annoying. Complementary to this the students were invited to join a focus group and here they were able to give voice to their experience with the intervention.

On the one hand the reflective questions were used in a more practical way as these questions were all part of the systematically gathered data. In that sense it served a more practical purpose. On the other hand these questions were input in clarifying practice as experienced by the teachers and the students regarding the pre-teaching and its effect on the students. The questions were also used to explain underlying views regarding the execution of the intervention. As such the knowledge gained with the execution was shared.

6.2.13 The element of Reflective Subjects

Table 6.2: *Presence of elements of table 2 in Case #2 in the Evaluation Phase*

Subjects	Elements Present	Example (I)	Example (C)
Who	Teacher		*Teacher logs; flash visit*
Does	Teaching forms; individuals		*Teacher logs; flash visit; focus group with children*
With Whom	Students		*Teacher logs; focus group with children; student questionnaire*

During the evaluation phase the subjects of *who, does,* and *with whom* were addressed. Within this phase logbooks, flash visits, a student questionnaire and a focus group with the children were used to address the implementation of the design and its added value.

Thus, the subject of *who* was considered by the PLC as the teachers were executing the pre-teaching. During this process they kept logs and were visited by the director minimally once a week. The logbooks were used to express the findings of the teachers regarding the design. An example was provided by the CPO e.g.: "*what did you do during the pre-teaching"* and "*Was there an effect on the classical mathematic lesson, if so, what then?".*

Successively, *with whom* was addressed in the PLC meetings as the students filled in a student questionnaire with questions as e.g.: "*I am satisfied with my mathematic performance".* They were also invited to join a focus group in which conversations are held with them. Questions asked are for example "*"What do you think about the past mathematic lessons?"* and "*Why did it/did it not help you to hear the subject matter beforehand?".*

The subject *does* was seen in the CPO for this phase as the instruction method was investigated. Here the logbooks, flash visits, a conversation with the teachers and a focus group with the students contributed to the findings regarding the execution and thus the actions during the mathematic lesson.

Here the reflective subjects were used in a more practical way. They were considered in the systematically gathered data. However, the data was used to clarify practice and explain underlying views and therefore the subjects are also used in such a way. Thus, the reflective subjects were used in two ways by the PLC.

6.3 Case #3

This PLC was established for the CPO of the MLI student in response to the individual practice research a year before by the same MLI student. This corresponded with the aim to learn with and from each other. It consisted of 5 members which were divided from preschool to grade 2 teachers. The PLC members were chosen, because they were the teachers who were going to execute the innovation design of the CPO together with the MLI student. The theme of the PLC was feedback, based on success criteria. The goal was to implement a system in the lower grades based on success criteria in mathematic learning goals. In this particular PLC the focus did not only lie on designing a method wherein students are provided with feedback based on success criteria, but also, on the collective learning from the members of the PLC. The PLC was not facilitated by the school and the members had to dedicate their own time to the PLC. The effect of the intervention designed by the PLC derived from the CPO was that it seemed that on many points individual growth was seen in applying the success criteria and feedback. The students seemed to be more involved when the teachers spend time on the success criteria by providing them with feedback. Considering collective learning, the teachers in the PLC seemed to have increased in their level of collective learning. It was also considered that reading literature, executing the design and developing a shared vision and ambition gave an impulse to the PLC. Subjects that were addressed in this PLC were varying every time and in the process of becoming a PLC the members were gradually growing from more peripheral business to the goal of the PLC. Subjects were for example the collective learning cycle; look backing on what previously is being done; literature; and the data that was collected by the MLI student.

6.3.1 Diagnosis

6.3.2 The role of experience, data and literature

In the diagnosis phase ***experience*** was found to be addressed. In starting the PLC the focus was to determine what they wanted to accomplish. Hence, the goal of the PLC. This has been done collectively in a conversation which had the input of several members based on their experience with feedback and success criteria, for example as the PLC-members provided the PLC with their knowledge about the subject.

Scientific ***literature*** was addressed during this phase according to the interview and CPO. It was used to determine the definition of feedback and success criteria. This also contributed to the knowledge gain of the PLC members with regard to this subject. Eventually this process was needed for the PLC members in order to establish the design criteria of the intervention during the phase of diagnosis. Evidence was found to be input into the conversation e.g. (C): *"The insights gained from literature (…) the PLC has chosen the following definition of feedback and success criteria*".

But, the reading and sharing of literature throughout the PLC seemed not to be something that was done by everyone outside of the PLC setting e.g.: "*I'm looking further for articles or information of any kind and movies. And I noticed that it took a very long time before others went along with it. They were sitting here, very enthusiastically, sharing things. But, when the meeting was over the daily practice is there again and it stopped".* Literature also seemed not to be appreciated by everyone in the PLC, instead of a few members. This is granted to the fact that it is not in the teacher culture and the feeling of "having little time left". The members who did read literature read it for their own development and were very eager to share what they have read because it was expected to contribute to the PLC. Thus, the appreciation of literature was divided. The positive appreciation was that it provides you with several possibilities to look at education and it helps making decisions based on knowledge.

Data was collected by the MLI student and consisted of a silent dialogue, questionnaire operation of the PLC, interviews, and the colour test of De Caluwé (2003). The silent dialogue, in the form of word writing on post-it regarding a question, was used to establish the focus of the intervention in the area of mathematics. The questionnaire regarding the operation of the PLC was conducted to gain insight about any chances and frictions that might influence the upcoming innovation. The interviews were used to frame the current situation as experienced by the teachers and especially to determine what the school needs and why the teachers still work at the school. Finally, the De Caluwé (2003) colour test was used to represent insights into the thinking and actions relative to change. While gathering this data experience played a role. This data was all gathered during this phase to determine which factors might influence the entire process of the intervention. During the PLC meetings in this phase this data was used as input into the conversation. For example the questionnaire used to express personality traits into colours. The results of this questionnaire were used to give meaning to it by the PLC members.

During this phase also other types of data were used. Evidence was found in the CPO that these data were used to establish a starting situation. This was used to compare with the data gathered during the intervention and was eventually used in the evaluation phase. For example a teacher questionnaire and a teacher observation were conducted. The teacher questionnaire was used to establish how the phases of feed-up, feedback and feed-forward were applied in the grades in the intervention and to be able to refine the research and innovation focus. The observation was conducted to see whether the results complied to the observations in the educational practice. These were both part of the conversations during a PLC meeting, as the questionnaires were filled in by the PLC members, the observations were attached to the questionnaire, and the results were schematically presented and subsequently discussed. Data appeared to not only be input into the conversations. But it also showed to be support for an alternative action. It initially showed the current situation regarding the operation of the schools and the use of feedback and success criteria. Then, it provided the PLC with a guideline based on the teachers' perspectives what was needed to change the current situation. As such it was also used to support an alternative action e.g. (C): "*The results are being discussed within the PLC in order to decide on a follow-up action".*

Data was considered to be very valuable as background information into the process of student performance e.g.: "*To measure is to know".* And in the sense of following up on the data to create an alternative method of action the following example is quoted: "*With the student track system, the students are being brought into perspective. Without this system you see a lot occurring in a student, but sometimes the system puts an element forward what makes you consider about the student and what to do next."*

For this PLC during the diagnosis phase, the use of experience, data and literature seemed to be intertwined. This can be seen from the CPO as it stated that the PLC designs a two-part intervention. At first it aimed at increasing knowledge, based on the experience of some teachers with the subject and the literature that provides knowledge and skills about success criteria and feedback. Successively, the design aimed at a practical part where the teachers applied their knowledge in a design by which they worked within their group. Here data also played a role, together with experience and literature, as the data provided the PLC with the experience of the teachers regarding points of actions to change the current situation and which is considered in the design of the intervention.

Which seemed to be input as well is the individual practice research from the MLI student. The IPO was used as input into the conversation as it provided insight in the deployment of success criteria and feedback in the higher grades.

6.3.3 The elements of Reflective Questions

With regard to the conversations that stem from either a subject or an activity several questions were seen within the interview and/or the CPO. The following *table 7* shows how the elements of table 1 were present in the PLC's' conversations in the phase of diagnosis.

Table 7: *Presence of elements of table 1 in Case #3 in the Diagnosis Phase*

Questions	Example (I)	Example (C)
1. What was the context?		*Questionnaire operation of PLC; Interviews*
2. What did you want to achieve?	*"First checking out what it is we want with each other, what do we want to achieve."*	*Cycle of Collective Learning; Developing Ambition*
3. What did you do?		*Observation*
7. What is the ideal situation?	*"What should the learning goals look like?"*	*Literature in CPO; What does feedback and success criteria look like?*
8. What are the limiting factors preventing the achievement of the ideal situation?	*"What is limiting us? Yes, there are no materials available"*	*Questionnaire: operation of PLC and interviews*

In the diagnosis phase the elements of context (*question 1),* achievement (*question 2),* teacher actions (*question 3),* ideal situation (*question 7),* and limiting factors (*question 8)* were addressed. Evidence was found for the element of context to appear in the PLC from the CPO. This was also part of the conversations of the PLC as it involved the questionnaires into the operation of the PLC. This provided a context in which the intervention needed to be designed and executed. Here possible factors that might influence the design, implementation and further execution were disclosed by the PLC. Therefore the context was taken into consideration during the PLC meetings. Another way wherein the PLC considered the context is in which groups the intervention will be carried out and in what way the success criteria needed to look like to fit the context of each participating group.

The element of "what do you want to achieve" appeared in both the interview and the CPO. It was used in two ways as suggested by the example from the interview (see *table 7*). Within the CPO the PLC followed the cycle of collective learning which involved approximately six steps. The first step was developing an ambition. This ambition needed to be established to determine for example the goal of the PLC. Here the intention was to establish what the PLC wanted to achieve e.g.: (C) "*(…) Also, the teachers want to know how to proceed with the learning goals. From the conversation it became apparent that they want to know how they can provide the students with feedback".* This was part of the PLC meetings wherein amongst other things an observation with regard to the use of feedback and success criteria was discussed. Therefore this element was taken into consideration in the PLC meetings.

Regarding the third element "what did you do" it was as being part of the conversations during the PLC meetings. The CPO provided a number of examples of the observation list for teachers wherein they mentioned their actions. This referred to this element, e.g.: "*At the start of the mathematic lesson the learning goal is mentioned*". This observation was used to establish what actions the teacher took with regard to the use of feedback and success criteria.

Looking at the element of the ideal situation it seemed to appear within both the interview and the literature the PLC used in order to establish how feedback and the success criteria should look like. This was part of the conversations in the PLC in this phase in support of the consulted literature. Here it was used to find a definition regarding success criteria and feedback.

Considering the last element, limiting factors evidence was found in the interview regarding the non-availability of materials (*see table* 7) and in the CPO. Firstly, a questionnaire was used to consider the operation of the PLC. This was done to establish factors that might influence the participation and design of the intervention in a limiting way. The CPO provided an evidential

example e.g.: "*It is indicated that the beginning is often enthusiastic, the start of something new, but successively the innovation is not being evaluated and abided"*.

The reflective questions were used in a practical way when materials were considered, what the learning goals should look like and also any limiting factors that might influence the operation of the PLC. It was also used to explain underlying views in for example establishing what the PLC wanted to achieve.

6.3.4 The elements of Reflective Subjects

With regard to the conversations that stem from either a subject or an activity several questions were seen within the interview and/or the CPO. The following *table 8* shows how the elements of table 1 were present in the PLC's' conversations in the phase of diagnosis.

Table 8: *Presence of elements of table 2 for Case #3 in the Diagnosis Phase*

Subjects	Elements Present	Example (C)
Who	Teacher	*Questionnaire operation PLC; interview; observation*
Does	Teaching forms; individuals; interaction	*Literature*
With Whom	Students	*Introduction; developing ambition; reason and practical problem*
When	The importance of time	*Questionnaire PLC*
Where	Possible places of action with pros and cons	*Developing Ambition*
Which Sources	Method and Material	*Literature*
Why / By What	Providing reasons	*Reason and practical problem*

The subjects *who, does, with whom, when, where, which sources* and *why/by what* were addressed in the diagnosis phase. Concerning the subject who the element of the *teacher* was present as they were the executioners of the innovation. They were considered several times by the PLC as for example in the interviews, observations and teacher questionnaires. In the interview their view with regard to the situation at their school was taken into consideration. This was done to consider which factors might be present which can influence the process of the intervention. The observations were done with the intent to establish whether the use of feedback and success criteria was present and to which extent this was done. The teacher questionnaires were used to measure to which extent feed-up, feedback and feed-forward was used by the teachers within their lessons.

For the subject of *does* literature was used in the first instance to establish what the success criteria and feedback should look like. Within this phase the outline of the intervention was established. This also was seen regarding the students for the subject *with whom.* These were part of the conversations in the PLC meetings as they were the subject of the intervention. The intervention was designed to benefit the students and was executed while instructing them.

The subjects of *when* and *where* were seen in either the interview or the CPO. *When,* for example is seen as time was considered during the questionnaire into the operation of the PLC's and the general conversations of the PLC meeting where time was mentioned e.g. (I): "*No, no I did not have time for it"* regarding reading literature and an another example e.g. (C): "*Friction arises when time and materials are being discussed.*

Where was considered at the beginning of the intervention. Within the CPO, chapter developing ambition an example was provided e.g.: *"after implementing working with feedback and success criteria in the upper grades in the previous year it is considered by the PLC to also implement it in the lower grades".*

With regard to the subject of *which sources,* the PLC considered the method and materials needed for executing the intervention, for example mathematic material, several times. The method was part of the diagnosis phase as seen in the CPO. This is considered by reading literature about the

subject of self-regulation, feedback and success criteria and this was discussed in the PLC in advance of the design phase.

The last element that was considered by the PLC in this phase, the element of *providing reasons* was found in the CPO's reason and practical problem. Here the reason for the subject of feedback and success criteria was mentioned. This is also what was discussed in the PLC when they needed to establish what they wanted to achieve. It was also seen in the use of literature to support the outline of the intervention design.

On the one hand the reflective subjects appeared to be used in a more practical way as they related to the application of the intervention e.g. considering the time in which the PLC had to operate. On the other hand it is used to explain underlying views e.g. the teachers' view regarding the school's situation.

6.3.5 Design

6.3.6 The role of experience, data and literature

Experience is a widespread phenomenon that was used by the members of the PLC. This has been many times input for a conversation e.g.: "*Everyone thought, well yes, I will say something out of my own experience".* When gradually growing into the innovation design, experience with the success criteria was input for the conversation wherein knowledge about this subject was being shared with the other PLC members. This experience contributed as support for designing the intervention. For example a coach in mathematics provided some with the insight in splitting up the mathematic learning goals. This experience was input in the conversation wherein the members shared and processed this information into practice and asked each other "*what will you do and what not?"*.

While this example of experience was being shared it formed input within the PLC. Other experiences regarding the execution of the intervention were several times shared between members of the PLC, but not explicitly transferred to the PLC meetings where it could have been shared with the other members. This was according to the interview and evidence was provided by e.g.: "*It was more in-between, that you were just saying: I did this and that today. How did that go with you? I noticed that.. and then you pointed out the positive and less positive things. Just quickly together and we continued…".*

During the design phase ***data*** was gathered. This data consisted of a logbook, questionnaire start and end-measurement, a storyline, and questionnaire of collective learning based on Castelijns et al. (2009). Evidence was found in the CPO. But, no evidence was found that these data were input into the conversations of the PLC during the design phase. It was only found to be conducted as follows from the CPO e.g.: "*While conducting the logbooks it appears that the preparation of the posters takes more time than was initially estimated. The consultation between the teachers was very helpful".* This is eventually used in the evaluation phase, but seemed to appear during the design phase.

Scientific ***literature*** on the other hand appeared to be input for the conversations during this phase e.g.: (C) "*From the studied literature the following design criteria are established by the PLC".* The MLI student provided the PLC with articles and/or books and this was read together in several PLC meetings. Then the literature was discussed. Support for action was found in literature by the PLC. For example providing the students with feedback on their tasks and the process of self-regulation. And, literature about this subject for example provided them with support how to implement this in the design of their intervention. Which, was discussed in the PLC meeting about the innovation design.

Experience, data and literature were combined. Experience formed input into the conversations independently, but it was also used as input for the data. For example, the data that was gathered during this phase was based on the experience of the teachers while executing the design.

Experience and literature were combined as the existing experience of some teachers with the subject and the gained knowledge from the literature were both used to design the intervention.

6.3.7 The elements of Reflective Questions

Table 7.1: *Presence of elements of table 1 for Case #3 in the Design Phase*

Questions	Example (I)	Example (C)	Example (P)
6. What kind of effect did it have on the students?	*"Evaluating your trial in the classroom"*	*Logbook*	*These mathematic learning goals will be elaborated together with the children"*
6a. What did the students want to achieve?			
6b. What did the students do?	*"Yes, we looked at what the students did."*		
6c. What were the students thinking?			
6d. How did the students feel?			
7. What is the ideal situation?	*"What should the learning goals look like?"*	*Literature in CPO What does feedback and success criteria look like?*	

In the design phase the elements of students (*question 6 to 6d)* and the ideal situation (*question 7)* were addressed. Regarding the element of students evidence was found in two ways. By for example (C) getting a view on the student's behaviour, considering these elements, logbooks were filled in by every teacher. This was part since data was gathered during this phase. The interview provided us with an example of this element as proposed in *table 7.1*. However, no further evidence was found in either the CPO and the interview for the other questions under question 6. This is granted to the fact that in the CPO it was indicated that, although literature suggested that the increase of engagement in students can be achieved by involving them in drawing up the success criteria, the PLC choose to wait with this step. They first wanted to feel more comfortable with the subject themselves.

Within the design phase the element of the ideal situation was described in more detail. Here it was used to establish the design criteria to a more defined extent. It was based on the literature provided by the MLI student and involved the establishment of what the feedback and success criteria should look like and complementary to that what the learning goals should look like.

While executing the intervention the element of students and teacher actions were not found to be present between all the PLC members during a PLC meeting, but instead, were used by the PLC members with regard to each other to more extent. The following example from the interview was provided e.g.: "*"What do the students do in the class was more something that went in between things. That I told you what I did in class today and how did that go for you? And evaluating your trial and feeding this back to each other. But, that did not happen during the meetings".*

It appeared that the reflective questions were used in a practical way by the PLC in the design phase. For example the learning goals were further developed and considered in the logbooks while gathering data. This related to the application of the design. It was also used to clarify practice and explaining underlying views. However, this relates more to be used between members outside of the PLC meeting as it was not always transferred to the whole PLC.

6.3.8 The elements of Reflective Subjects

Table 8.1: *Presence of elements of table 2 for Case #3 in the Design Phase*

Subjects	Elements Present	Example (C)
Does	Teaching forms; individuals; interaction	*Literature; Logbooks*
With Whom	Students	*Logbooks*
Which Sources	Method and Material	*Information Cards; Design Criteria*
What Purpose	Learning goals	*Design criteria*
Why / By What	Providing reasons	*Literature*

The subject of *does* was presented by the teaching form. This was seen within the CPO as literature was used by the PLC to establish how feedback and success criteria needed to look like to implement in their design. Also, the logbooks were part of this subject. For example the teacher kept up a logbook with regard to their actions to the individual students and the interaction between them. This was also seen for the element of *with whom*. As the students were the subject of this intervention and were taken into account in for example the logbook (C) by e.g.: "*What did you notice about the behaviour of the students during the execution of the activity?".*

Then in designing the intervention, materials were considered several times and they designed amongst other things information cards. These information cards were materials teachers could use "how to formulate success criteria" and "how to provide feedback on the success criteria". In the interview another example for their consideration of material was e.g.: "*We mentioned to each other: Yes, we do not have any materials available".* In supporting this quote from the interview, the CPO provided an example that in the teacher's opinion too few mathematic materials were considered to be available.

Regarding the element of *what purpose*, wherein learning goals were part of this intervention and for which evidence can be found within the observation of the teachers and in the design criteria of the intervention an example was e.g. (C): "*The learning goal may not contain context*". Parallel to this element was the element of *why/by what's* providing reasons. When considering the last reflective subject *providing reasons* evidence was found in the CPO. It was seen in the literature which supported the design of the intervention.

Here the reflective subjects were used in a more practical way as it related to the execution of the design. For example which materials were needed and the criteria to which the design must comply. It does not relate to clarifying practice and/or explain underlying views. However, it appeared that it was sometimes used to share knowledge, by for example the read literature which contributed to the knowledge gain of the PLC members which was deployed while designing the intervention.

6.3.9 Evaluation

6.3.10 The role of experience, data and literature

The use of ***data*** characterized this evaluation phase. During the phase of design data was gathered which was input for evaluation. It was used to measure the effectiveness of the intervention and to establish points of improvement. The used data were a logbook, questionnaire start and end-measurement, a storyline, and questionnaire of collective learning based on Castelijns et al. (2009). Also, a questionnaire with regard to the design, conducted before and after the design, was data input into the conversation in the PLC meeting which involved the evaluation phase. The data was used in two ways according to the CPO, (1) to evaluate practice, and (2) to evaluate the context. The latter was used to evaluate the process of collective learning in the PLC.

The logbooks were used to evaluate the design and execution of the innovation. Furthermore it was used to e.g. (C): "*To find out whether the design was actually feasible and to get insight into the student's behaviour every teachers fills in the logbooks."* The teachers had to keep up the logbooks several times to a maximum of four times.

The goal of the innovation design was to instruct teachers in developing success criteria in order to provide the students with feedback related to it. The start- and end measurement questionnaire was used to evaluate this. The levels of feedback were used in the questionnaire. The emphasis was on the level of feed-up as e.g. (C): "*during this level the success criteria are offered".*

For further evaluation the data type of 'storyline' was used. During a PLC meeting this was executed, first individually and successively a conversation about it. Here the teachers were asked to draw a line which represents the time period of the CPO. On this line every important event as considered by the teachers was indicated. Together, the PLC members discussed which events were important to them and why.

The collective learning questionnaire was only conducted at the end of the intervention and thus the collective process. At the start of the collective process there was too few time available to deploy the questionnaire. Therefore, the PLC members needed to record the perceived start situation and the end situation in one measurement. It was used to gain insight in a structural manner into the growth of the PLC during the collective process. During a PLC meeting the questionnaire was conducted. After filling in the questionnaire, the MLI student calculated the average growth per item. This was done to draw conclusions from it. When there seemed to be mutual differences it was discussed in the PLC.

While gathering the data the ***experience*** of the teachers were overall used as input. Evidence hereof was provided by the CPO e.g.: "*To find out how the teachers experienced the collective research process, the method 'storyline' was opted for".* Also, while conducting the questionnaire into the collective learning process, the experience of the teachers regarding the aspects of collective learning were input for the data. Regarding the logbook experience was also found to be input e.g. (C): "*It summarizes the experiences of the teachers very well".* Experience and data were combined as experience formed input into the data and was also used during the PLC meetings to discuss the data results. Thus, the data was interpreted and explained by the experience of the teachers regarding the subject. However, while ***literature*** was used to choose and develop the data, no evidence of its use, to for example explain the results of the data, was found in either the interview or CPO.

6.3.11 The elements of Reflective Questions

Table 7.2: *Presence of elements of table 1 for Case #3 in the Evaluation Phase*

Questions	Example (I)	Example (C)
4. What were you thinking?		*Logbook*
6. What kind of effect did it have on the students?	*"Evaluating your trial in the classroom"*	*Logbook*
6a. What did the students want to achieve?		*Logbook*
6b. What did the students do?	*"Yes, we looked at what the students did."*	*Logbook*
6c. What were the students thinking?		*Logbook*
6d. How did the students feel?		*Logbook*
8. What are the limiting factors preventing the achievement of the ideal situation?		*Logbook*

In the evaluation phase the elements of thinking (*question 4),* students (*question 6 to 6d),* and limiting factors (*question 8)* were addressed (*see table 7.2).* Concerning the element of thinking, evidence was found in the CPO. The logbooks were used to address the effect of the use of success criteria and feedback and concerns the thoughts of the teachers about this while executing the intervention. The following example was provided e.g. (C): "*What do you think the students have learned?".*
Further evidence with regard to this element has not been found in either the interview or the PRO. No evidence was found with regard to the element of the teacher's feelings.

The element of thinking was complementary to the element of students. Regarding this element evidence was found in two ways. By for example (C) getting a view on the students' behaviour logbooks were filled in by every teacher e.g.: "*What stands out about the student's behaviour while executing the activity?".* However, on the one hand, no further evidence was found in the CPO for the particular questions except that the overall behaviour of the students was considered. Yet the interview provided, on the other hand, an example for question 6b as shown in *table 7.2* e.g.: "*Yes, we look at what the students did".* After analysing the logbooks within the PLC it seemed that the behaviour of the students was enthusiastic and involved. In that sense the effect of working with the success criteria was brought into perspective by the PLC which is an example for question 6 in *table 7.2*.

Considering the last element of *table 7.2*, limiting factors (*question 8*), evidence was found in the interview in the CPO. After analysing the logbooks the biggest limitation was considered to be the mathematic method used by the school while working with the posters. The method applied for many learning goals in a high pace in one block. The limitation resulting from this was e.g. (C): "*Because of this, the test goals of the posters are not discussed long enough".*

The reflective questions served at first a more practical purpose as they were part of the data which related to the application of the intervention and its effectiveness. However, the questions used in the data were all used to clarify the practice while executing the design and explain the underlying views of the teachers regarding the execution to determine the effect on the students.

6.3.12 The elements of Reflective Subjects

Table 8.2: *Presence of elements of table 2 for Case #3 in the Evaluation Phase*

Subjects	Elements Present	Example (C)
Who	Teacher	*Teacher questionnaire; Logbooks; Storyline; Questionnaire Collective Learning*
Does	Teaching forms; individuals; interaction	*Teacher questionnaire; Logbooks*
With Whom	Students	*Logbooks*
When	The importance of time	*Teacher questionnaire*
Why / By What	Providing reasons	*Storyline*

During the evaluation phase the subjects of *who, does, with whom, when, why/by what* were addressed. Concerning the first subject, the element of the teachers was present as they were the executioners of the innovation. They provided the PLC with input into the conversation and were participants whilst gathering the data. The CPO provided us with examples wherein the teachers were part of the conversations as they fill in the teacher questionnaire and the logbooks. And, expressed their experiences in a storyline and in the questionnaire of collective learning.

Evidence for the subject of *does* was found within the element of teaching forms and the interaction with the individual students. Literature was used by the PLC to establish how feedback and success criteria need to look like to implement in their design. It was seen within the teacher questionnaire and the logbooks. The examples were provided by the CPO and the first concerned the teacher questionnaire where the actions of the teacher were recorded e.g.: "*The goals I provide are SMART formulated".* The second concerned the teachers' actions to the individual students and the interaction between them e.g.: "*When a goal is (partially) not achieved, I discuss the follow-up actions with the children".* This element and examples were complementary to the subject of *with whom* concerning the students. Since, the students were the subject of this intervention and were taken into account during the entire process, by considering them while gathering the data and discussing the results within the PLC. Here it was considered whether the intervention was successful for the mathematic performance of the students.

The subject of *when* was seen within the CPO regarding this phase. It was seen in the teacher questionnaire in the following way e.g.: "*I mention on which goal we are going to work on at the beginning of the lesson".* It was also seen in the logbook where time was considered in how much time was spend on preparing the lesson's activities.

The last subject seen, while evaluating the process, was *why/by what.* Evidence was provided by the CPO. Whilst developing the storyline individually and evaluating it together in the PLC meeting it was considered why certain events were experienced as important or outstanding. This was related to the element of providing reasons, because it was explained by the PLC members how these events have come to outstand other events.

Here the reflective subjects were used in a practical way as for example the teachers were considered as the executioners of the design while applying the intervention. And also in the same way as the reflective questions as the subjects were considered in the data. On the other hand, however, the subjects were also used to clarify practice and explain the underlying views by for example using the data type 'storyline'.

6.4 Case #4

Regarding this case a division is made in the results between the interview with the subject of the PLC World Orientation (WO) and the CPO with the subject of the PLC higher order thinking skills. The latter was implemented during the WO lessons. The CPO provided support in presenting the results when it was considered to be relevant for the PLC WO. For this particular case only the diagnosis and design phase will be considered, as the evaluation phase was not present in the PLC of WO. The PLC has not yet completed the design phase.

The PLC consisted of in total 6 members. The members were selected based on interest, but it was made sure that every grade was represented. The members were teachers and pedagogical employees of the day-care. The PLC was established by presenting the subject and then signing up for the particular PLC. The theme of the PLC was world orientation. It involved several core concepts and for which learning goals were designed. The goal of this PLC was to redesign the existing method of world orientation and to establish new learning goals, learning activities and formative assessments. The PLC has not finished yet, which means that it is still developing. The school does not work with work books and stimulates the children in discovery learning where they have to do their own researches and by doing this ticking the learning goal boxes. The children are sometimes divided per grade, but also per individual level. The school wants their children to become critical thinkers with regard to their own learning process. Within the PLC meetings several topics were discussed, such as, looking back on what they did previously, share point, core concepts, and designing learning goals.

6.4.1 Diagnosis

6.4.2 The role of experience, data and literature

The diagnosis phase for the PLC world orientation (WO) in particular made use of ***experience*** according to the interview. It was noticed by the members that whilst working with core concepts in WO it did not seem substantial. There were no particular learning goals, causing the activities to be less meaningful. Therefore they formulated a research question in order to provide them with a goal for the PLC. Thus, within this phase they chose to redesign WO in which more content was given to the learning goals.

Literature in the form of e.g.: scientific articles and books were used within the PLC and it also formed input for the conversations. Especially, in the beginning of redesigning the core concept of world orientation. At first they oriented themselves in the field of world orientation in education before handling the core concepts. It was more read and distributed during the PLC meetings than outside of the PLC, because some members noticed that literature sent in advance of a meeting was not read. Thus, during the PLC meetings literature was being searched which could serve the goal of the PLC.

During the entire process of redesigning WO no ***data*** was used as either input, support or for evaluating e.g. (I): "*We are not yet there that we need it. But when we do, we will think about it".* The PLC has not yet reached that point in the design. They would use data as support in tracking the learning process of the students. Data is valued by the PLC as it substantiates the process of the students and it provides insight for parents as well. Next to that it is seen as an extra resource to change your approach e.g.: "*Yes, it is actually, I think, an extra way to adjust your approach".* As it was not applied in the WO PLC it will not be discussed any further in this case.

Experience and literature were combined in such a way that the experience with the current WO method was used as input to find literature about the subject to gain more knowledge about it in order to develop a better WO method.

6.4.3 The elements of Reflective Questions

With regard to the conversations that stem from either a subject or an activity several questions were seen within the interview and/or the CPO. The following *table 9* shows how the elements of table 1 were present in the PLC's' conversations in the phase of diagnosis.

Table 9: *Presence of elements of table 1 for Case #4 in the Diagnosis Phase*

Questions	Example (I)	Example (C)
1. What was the context? 2. What did you want to achieve? 4. What were you thinking?	*"The surroundings also plays a role"* *"We wanted to achieve that more content is given to the learning goals"*	*Chapter Social Responsibility*
7. What is the ideal situation?	*"We aim to connect the right learning goals with the core concepts, and now we are looking at fitting learning activities"*	*Design Criteria*

Regarding the diagnosis phase evidence was found for the elements of context (*question 1),* achievement (*question 2),* thinking (*question 4),* and ideal situation (*question 7).* Considering the first element context (*question 1),* evidence was found in the interview that the context in which the lesson takes place is taken into account by the PLC by holding notice of the environment in which the lesson was given to the students (*see table 9).*

With regard to the second element of achievement (*question 2)* this was also seen as to the subject of world orientation. The PLC aimed at providing more content to the learning goals and dividing the core concepts fitting the learning goals. Then the learning activities were designed to fit the learning goals. It has been the red line during the whole process of redesigning the core concepts of world orientation. When considering the CPO an example is provided that within the core concepts of world orientation members of the PLC wanted to gain knowledge about higher order thinking skills and how to teach children to use these skills to develop questions related to world orientation.

The element of thinking (*question 4)* was not explicitly seen within the interview. But in the diagnosis phase experience with the earlier WO lessons indicated that the teachers thought about how the WO lessons were provided initially. In that sense the element of thinking was related to the experience which formed input in the PLC's conversations.

The ideal situation (*question 7)* was taken into account within the PLC as the interview showed whilst the PLC considered what the learning goals should look like and as shown in *table 9.* It was also seen within the CPO as its subjects runs parallel with the design of the core concepts. Here the design criteria were evidence of what the ideal situation looks like. These design criteria presented how the intervention needed to be designed and for the teachers how it needed to be executed.

The reflective questions appeared to be used in a more practical sense as they related to the current application of the WO core concepts in the diagnosis phase. Also, connecting the right learning goals with the core concepts and looking for fitting activities were more practical as this related to the application in their education. On the other hand, they were used to clarify the current practice and explain the underlying views of the teachers regarding the practice in order to solve the problem to improve their students' achievement.

6.4.4 The elements of Reflective Subjects

With regard to the conversations that stem from either a subject or an activity several questions were seen within the interview and/or the CPO. The following *table 10* shows how the elements of table 2 were present in the PLC's' conversations in the phase of diagnosis.

Table 10: *Presence of elements of table 2 for Case #4 in the Diagnosis Phase*

Subjects	Elements Present	Example (I)	Example (C)
Who	Teacher/Pedagogical Employee	*"There are both teachers and pedagogical employees of the day-care represented"*	
What	World Orientation	*"The theme of the PLC is world orientation"*	*CPO The Context*
Where	Possible places of action with pros and cons		*CPO The Context*
With Whom	Students		*Appendix Vision*
Which Sources	Method and Material	*"We used the existing core concepts of world orientation";*	

In the diagnosis phase the subjects of *who, what, where* and *with whom* were addressed. Regarding the first subject, the teachers was considered. The interview provides examples of this evidence for the element of *who*. Within this particular PLC not only teachers participated but also pedagogical employees employed in the day care. This day care is located in the same building as the school. The teachers and pedagogical employees were subject of the PLC's conversation as they both were the designers and executioners of the intervention. It is also mentioned that it is taken into consideration that often the pedagogical employees have had a different type of educational level than the teachers.

The subject of *what* was related to the theme of the PLC and its goal. The PLC aimed at redesigning their WO lessons. Within these lessons the higher order thinking skills of the CPO's PLC were implemented as these e.g. (C): "*Within core concepts the development of higher order thinking skills are relatively easy to implement".* These were both subject of conversation during both PLC's meetings.

The subject of *where* was also part of the PLC meetings as it needed to be established in which grades the world orientation lessons were provided. The WO lessons were provided in grade 3 – 4 – 5 and 6. Regarding the higher order thinking skills this is also considered. The CPO provided an example hereof e.g.: "*The innovation will be executed in grade 5 and 6".* This was discussed in the PLC as to why this is opted for. This subject is according to the CPO more practically applied.

With whom was also taken into account as the students were the ones who received the current and redesign of the WO lessons. When the learning goals seemed not substantial enough for the core concepts and not to fit with the learning goals the students were taken into account.

Also, the subject of *which sources* was taken into account by the PLC as instead of designing a whole new WO method, they decided to use the existing core concepts and to redesign these to fit with for example their vision.

The reflective subjects appeared to be used in a more practical way in the phase of diagnosis as they were considered in for example the operation of the PLC and the application of the intervention.

6.4.5 Design

6.4.6 The role of experience, data and literature

Evidence was found for ***experience*** during the phase of design. Throughout the interview it became apparent that the conversations in the PLC meetings were initiated by an ***experience***. This can be explained as an experience in practice or the experience PLC members have with regard to a particular subject. For example, dividing the learning goals was done based on the experience of the teachers with the subject of WO. The PLC was currently designing learning activities complementary to the goals. Here experience with instruction methods and activities formed input into the conversation. As such, experience was both input for a conversation as support for creating an alternative method e.g.: "*From a particular experience with the design a conversation starts and this also leads to think about another way and try this out".*

An example of when an experience was input for a conversation is that several teachers experienced that due to splitting up the goals the order in which the core concepts were presented was not very suitable. The teachers experienced the core concept of "Grow and Life" not to be present in Spring, which was opted for again by the teachers. This was input into the conversation of the PLC with the intention to discuss what to do about it. Here experience was also support for what to do about this. Experience was seen as valuable input into the conversation which was also the case for example by bringing in the experience someone has with the design of a lesson. It was also highly appreciated by the PLC e.g.: "*And within the PLC there is room for us to share what we know and have, and that feels nice".*

During the design phase ***literature*** was used as support e.g.: "*And you indicated that in your conversations and that, when thinking about new approaches, you consult literature, don't you? Yes".* Within the PLC literature was not always read together, but what is read by a member was shared in form of tips. Also in meetings the members sometimes presented what they learned about a subject to each other. In this way the knowledge gained from ***literature*** was shared with others in the PLC.

Literature is highly appreciated by the members of the PLC as it is a way to substantiate your thoughts, opinions and actions. But the actual searching and reading of literature was not widely spread amongst the PLC members, and this was granted to the fact that many teachers were not used to doing so in education. The types of literature that were used were scientific articles, books, and trade magazines. Preference was given to articles written in Dutch, because of the readability.

Experience and literature were used independently, by for example only using teachers' experiences with the design as input and only using literature to gain more knowledge about the subject. They were combined when literature was addressed to explain what was experienced while executing the design and to find supportive knowledge and skills to create an alternative approach to deploy the next time. Therefore, a combination of experience and literature was used as input and support into the conversations of the PLC.

6.4.7 The elements of Reflective Questions

Table 9.1: *Presence of elements of table 1 for Case #4 in the Design Phase*

Questions	Example (I)	Example (C)
1. What was the context?	*"The surroundings also plays a role"*	
3. What did you do?	*"What did you do?"; "We did something and it didn't go as intended"*	
4. What were you thinking?	*"and that you observe what is happening in the classroom"*	
6. What kind of effect did it have on the students?	*"You observe what you see happening"*	*Chapter 3.4.4. Interview with students; Logbook teachers*
6a. What did the students want to achieve?	*"The students investigate a question and you hope that by doing this a number of goals can be achieved by the students, and that needs to be monitored"*	
6b. What did the students do?	*"I couldn't quite follow what that student was doing"; "I saw this happening by that group of students, then I asked some questions and thereafter they did this and this"*	
6c. What were the students thinking?	*"We also looked at what students might have been thinking"*	
6d. How did the students feel?		
8. What are the limiting factors preventing the achievement of the ideal situation?	*It is difficult to share your observations with others, because we are split up as a unit. Grade 5 and 6 are upstairs and 3 and 4 are downstairs"*	8. What are the limiting factors preventing the achievement of the ideal situation?

Considering the first element context (*question 1),* evidence was found that the context in which the lesson took place was taken into account by the PLC. The example provided in *table 9* shows that the PLC held notice of the environment in which the lesson was given to the students. For example that sometimes the students were split up based on their grade (5 or 6) or their individual level on the subject.

The element of what did you do (*question 3)* referred to the actions of the teachers. In the interview this element was directly related to the teaching practice during a world orientation lesson. The CPO provided a questionnaire for a start- and end measurement. Here the higher order thinking questions during the world orientation lessons were subject to this questionnaire. The teachers' action can be referred to by the following example e.g.: "*The question I ask connect with the child"* and several questions related to if the teachers "asked" for example whether there are arguments for and against something. So the action of the teachers referred to asking, but what the teachers did is central to these questions. Therefore this element appeared in the conversations of the PLC.

The element of thinking (*question 4)* has been seen within the interview. Although "thinking" or "thoughts" was not explicitly mentioned this example was put forward as this was opted by the interviewee as being present when asked for by the interviewer. The CPO provided an example for the element of thinking e.g.: "*I think I can make the difference if I ask higher order thinking questions".* Although, this was more a perception of the teachers abilities considering higher order thinking skills, than it was a thought during for example an activity.

Considering the students (*question 6 to 6d),* evidence was found as follows. The examples in the interview were directly related to the world orientation lessons. Question 6 was also exemplified in 6b, because here asking a question to the students had the effect that they were successively "doing this and this". As such, the teacher took the effect the question had in mind. But, it was mentioned by the interviewees that most of the conversations with this type of questions happened between both of them. The CPO provided an example of these questions in the group interview with the students. This is used to gain insight in the needs of the students regarding the core concept lessons of world orientation. Within this interview a mind map was used. Here the students were asked to answer the

questions “what do you think is nice about the core concept lessons” and “what do you think is not nice about the core concept lessons”. In addition to that the students were asked to write down their feelings, thoughts and experiences with the lessons. As such, particular evidence was found for the questions 6c and 6d. Also, the logbooks filled in by the teacher had the aspect of observing a student. Questions such as “*which thinking steps do you see the student take?”* were examples of evidence that students were taken into account within the element of students and its related questions. Another example was the appearance of question 6a. This question was not explicitly part of the conversations, as such that the teachers talked to each other about what the students wanted to achieve. But, with regard to the learning goals that were provided to the students and by investigating a question fulfilling these goals it was also presented in the conversation about the students.

The limiting factor element (*question 8)* was an example of why it was happening and also the following quote of the interview supported this e.g.: “*Yes, we are in the same room and are physically closer to each other, which makes it easier and more obvious to talk to each other”* and “*Where it happens, that is the place the conversations take place”.* The CPO too, provided evidence regarding possible limiting factors in the process of the intervention. This was seen in that the MLI student and the PLC considered several factors in the activity systems model. This to e.g.: “*Visualizing possible frictions and limitations in the team regarding the design and execution of the innovation”.*

In the design phase the reflective questions were used to clarify the practice for example executing the design in the lessons, to explain underlying views e.g. the notion that the order of core concepts are not congruent to the time of year, to directly solve the problems that occur while executing the design and to share the knowledge (experience) of the executing teachers with each other regarding the intervention.

6.4.8 The elements of Reflective Subjects

Table 10.1: *Presence of elements of table 2 for Case #4 in the Design Phase*

Subjects	Elements Present	Example (I)	Example (C)
Who	Teacher/Pedagogical Employee	*"There are both teachers and pedagogical employees of the day-care represented"*	
Does	Teaching forms; groups,	*Practical issues, such as the group is too big"; "Sometimes we divide the group into grade 5 and 6, sometimes they are divided based on their level"*	*Summary of bureau study*
With Whom	Students/interactional phenomena	*"I am not able to ask my questions properly to my students"*	*Summary of bureau study*
When	The importance of time	*"We were asked to move the core concept of Grow and Life back to spring"*	
Where	Possible places of action with pros and cons	*"Grade 5 and 6 are in the same room, as are we (...)"*	
Which Sources	Method and Material	*"We used the existing core concepts of world orientation"; "It is also about learning material, such as laptops."*	*Summary of bureau study*
What Purpose	Learning goals	*"We split up the learning goals and want to connect them to the existing core concepts. This sometimes results in a different order wherein the core concepts are presented"*	*Summary of bureau study*
Why / By What	Providing reasons	*We, together, reason sometimes like: Is it like this, and I think it happens because of this and this"; "We sometimes use literature to find reasons"*	

In the design phase the subjects of *who, does, with whom, when, where, which sources, what purpose* and *why/by what* were addressed. The subject of *who* for instance was considered as the teachers of grade 3 – 6 were the developers and executioners of the intervention. They formed input into the conversations several times by expressing their experience during the process. From the CPO it appeared that they were evaluating after each core concept.

The subject *does* was exemplified by the interview. Evidence for this subject was seen within how the groups were formed with regard to the instruction and the theme of the PLC. The CPO provided evidence for this element as well. The group interview in the CPO for example "*To which must the lesson comply in terms of (subject) didactics?".* This referred to how the higher order thinking skills needed to be implemented during a WO lesson.

As for the reflective subjects *with whom,* the students and interactional phenomena were discussed between the members of the PLC. For example how the students seemed to react to the teacher and the experience of the teacher that they were not able to ask their questions related to the content of the lesson properly. Evidence for this element was also found within the CPO. Here the group interview mentions pedagogic, didactics, and subject didactics which involved the interaction between teacher and students, and interaction between students as well.

Also the elements of *when* and *where* were taken into consideration by the PLC. The importance of time for example was seen within the interview when the teachers were executing the redesign of the intervention. This resulted in that the order in which the core concepts were provided to the students differed from before. The teachers experienced that some core concepts were more interesting in a particular time of the year. The example in *table 10.1* shows this element of time within the subject of *when* as evidence for its appearance in the PLC meetings. Also, the mentioning

of *where* was considered by the members of the PLC as it was easier to communicate with the member that is present in the same room as yourself. This close proximity to each other made it easier to discuss different subjects.

The subjects of *which sources* and *what purpose* were seen as follows. The interview provided the example e.g.: "*We worked out all of the learning goals and shared this on share point. And some people were simply not able to find it. Thus, we thought that this a point of attention in order for everyone to know where and how to find it. It is eventually more about the practical issues".* The material used here is share point. The CPO provided another example of materials in the bureau study e.g.: *"(...) for the means, among which digital learning materials".* Regarding the element of *what purpose* the CPO provided us with an example in the bureau study too e.g.: "*We provide children with the opportunity to achieve their goal".*

The subject of *providing reasons* was found within the interview. The example showed two ways in which this subject is handled. It was considered as that the teachers in the PLC do think of reasons why something happened or not. This was merely done based on their experience in teaching. Sometimes, however, they searched literature to provide them with reasons for what happened. This was sometimes also used to support another way to approach a situation.

The reflective subjects were used in two ways. On the one hand they were applied in a more practical way in for example determining which groups participated and the consideration of the PLC members in designing and executing the intervention. Also, for example what happens to the order of the core concepts when splitting up the learning goals. And, for example the materials were considered. This was all related to the application of the intervention in practice. On the other hand reasons were provided by the PLC members which related to the clarification of practice and explain the underlying views regarding this practice. Here the knowledge of the PLC members was shared in order to solve the occurring problem.

6.4.9 Evaluation

6.4.10 The role of experience, data and literature

From the CPO evidence was provided for the PLC of WO that the PLC evaluated after completing each core concept. Since ***data*** was not used by this PLC for WO particularly, ***experience*** seemed to play the only role whilst evaluating. The PLC, therefore, noticed that there is too little depth in offering and processing of the subject matter and the individual students' talents were not or not sufficiently addressed. This resulted in the PLC of higher order thinking skills.

Also, during the execution of the design the PLC members were evaluating the particular WO lesson with each other. This was also done based on the experience(s) they had while teaching the students e.g. (I): "*I could not follow the student at all, because the groups were too big, how can it be done differently?".*

Literature was seen while the PLC members were evaluating the lesson together. From the interview evidence for it was found as the PLC members were reasoning together why particular things occurred during the lesson e.g.: "*What did the students do and why did they do that?".* Literature played a part as the PLC members were using higher order thinking question which were based on literature they read about the subject. It was also seen in that literature was used to review the information e.g.: "*Well I read this then, but I notice that it is something to think about again, because how it goes for now does not work".* Here literature was used to review how it was suggested to be done in order for it to work well.

For this phase it was very important to mention that from the interview evidence of evaluation is found only to exist between members. Some of the findings in their evaluation were transferred to the PLC. But, mainly these "mini" evaluations were discussed between two members.

7. Conclusion & Discussion

Considering the results of the four cases the following conclusions were drawn with regard to sub research questions and the main research questions and the relation with achieving the goal of the PLC. In three of the four cases the goal of the PLC was evaluated. Within these three cases the PLC's noticed a positive effect of their intervention. However, this differed amongst the PLC's. For case #1 a positive effect was shown with regard to the teachers. Regarding the students a difference was noticed in the extent to which preschool students were able to work with the step cards relative to grade 1 students. Case #2 noticed an overall positive effect of the intervention on the teachers and the students. For case #3 an effective was visible, but not to a great amount. Case #4 had not reached the evaluation phase yet. Therefore, the effect of the PLC was not yet available.

7.1 The role of experience, data and literature

With regard to experience, literature and data it can be concluded that in three of the four cases all these elements played a role in PLC meetings. With regard to experience it was, in all four cases, many times the input of a conversation to the extent to which the members of a PLC experienced a problem or used their experience to express opinions or ideas. In addition to that it was used with regard to a particular teaching form or the experience of the teachers regarding for example their mathematic lesson. Thus experience seemed to be used in two ways: (1) the experience a teacher had with regard to the execution of the intervention and (2) the experience the teacher had with regard to the knowledge about a certain subject. The first form of experience was many times the input of the conversation and the second form the support from which the creation and execution of the alternative view and/or approach was substantiated. As such it formed input for a dialogue as well as support for creating an alternative method.

Data that were used during the PLC meetings were systematically gathered by the MLI student in three cases (Case #1, #2, and #3), such as interviews, questionnaires, focus groups etcetera. Data formed input for the conversations of the PLC. It was gathered in the diagnosis phase with the intention to establish a start situation. It was also, gathered during the design phase when the intervention was executed. These data were used to establish the end situation after implementing the intervention and to determine the effect of the intervention regarding the process and product in the evaluation phase. Also, its use formed input in pointing out any limiting factors which needed to be considered. Yet, it seemed not to play a part in creating an alternative method in the design phase, as it merely formed the basis on which a conversation took place.

The use of data in the diagnosis and evaluation phase is coherent with the use of data as proposed by Schildkamp et al. (2016). For example using data to define the problem which is congruent to the diagnosis phase, where data was used to frame the current situation and define its problem upon which the PLC decided on which educational problem they wanted to focus and for which the intervention was designed. Also, an intervention was implemented to improve the educational issue. Then for the evaluation phase, data was systematically gathered and evaluated in the PLC's. This is congruent to evaluating if the measures were implemented as intended (process) and if these measures were effective (product). The data that were used formed input into the PLC's' conversations which led to an exchange in ideas and opinions from where the focus of the PLC is established and from which an intervention originated. Thus, the role data played is as intended.

Case #4 showed that data was not used during either the diagnosis, design or evaluation phase. Therefore, it is concluded that it played no role in the PLC and its meetings. For the evaluation phase it needs to be considered that this particular PLC did not reach this phase yet. However, not using data in the other phases is not congruent to literature, where data use supports in making decisions for, for example, defining the problem and establishing the focus in the diagnosis phase and thereafter in the

evaluation (Schildkamp et al., 2016). Thus, the PLC would benefit from using data in supporting the decision for redesigning world orientation. Data gathered beforehand could contribute to their experience of the core concepts being not substantial enough for their education. For example, the experience of the teachers could be systematically gathered regarding the use of the core concepts of world orientation in the form of a questionnaire. Or, interviews could contribute to expressing the opinions of the teachers regarding the content of the core concepts. Thus, types of data are available to systematically present the current situation which supports in defining the problem, formulating a research question or a focus for the PLC. Since the PLC did not reach the phase of evaluation, because it did not reach its end yet, it is only suggested to gather data while executing the design in order to, when the process has reached the evaluation phase, it is substantiated by data to draw a conclusion from it regarding the process and product of the intervention design.

Also, data can be gathered and used during the design phase as well. As these data could provide insights whilst executing the intervention and therefore allowing for an immediate change of action. This is congruent to the model of reflective dialogue as well. Next to that data was considered to be input for a conversation (reflective dialogue). It can be used as support for revising the current approach which leads to an alternative view or approach as seen in figure 1 of the theoretical framework (see section 4.3, p. 8). This decision made for change is then based on data as proposed by Schildkamp et al. (2016).

There was a role for literature in the PLC meetings too. The PLC-members used literature to expand their own knowledge base and to share what they have read. Its role was to familiarize themselves with the subject of the intervention. Literature was also used to substantiate or to inspire the chosen actions. This was seen in the diagnosis phase. In addition to that it was seen in the design phase as well. Here it formed input in designing the intervention, for example establishing the design criteria. But, it was also seen as support for an alternative view or approach, as it was used as feedback when the execution in practice seemed not to correspond to the literature. This is congruent to the contribution of literature in a PLC (Thompson et al., 2006; Schildkamp et al., 2016; Schaap & Bruijn, 2017). However, in the evaluation phase literature did not play a role in the PLC. Its only use was seen within the CPO of the MLI student and no evidence was found for it to be used in or transferred to the PLC in either cases. The use of literature in this phase contributes to the clarification of the effect the intervention has regarding the process and product. Literature, for example can provide the PLC with evidence that confirms the results regarding student achievement for the subject. Or, it can be used to explain the occurrence of a particular effect.

Concerning literature use it seems to be diverged. On the one hand literature was used by the PLC in the diagnosis and design phase, but not in the evaluation phase. When it was used in some cases, the use of literature in the PLC needed to grow as the year progressed. This was seen in that some PLC members had to grow accustomed to the use of literature, since it is not in the school culture. In these four cases, because of the study program of the MLI students literature became part of the PLC. However, in some cases (e.g. case #2), its role gradually diminishes when the process further continues. It was especially used at the beginning of the design of the differentiated instruction for pre-teaching. This provided the PLC with the conditions which the design had to meet.

Literature was seen as providing knowledge gain about a subject in the diagnosis phase first and therefore as evidence in decision making (e.g. regarding the focus of the PLC), successively in the design phase (e.g. regarding the design criteria), and in the evaluation phase (Case #4) it contributes to the findings in either confirming, and/or substantiating or explaining the effect. Thus, its use in all the phases is strongly suggested as the PLC benefits from it (Thompson et al., 2006; Schildkamp et al., 2016; Schaap & Bruijn, 2017). Therefore, PLC's must use literature throughout the entire process: from the diagnosis phase, the design phase up to and including the evaluation phase.

7.2 The elements of Reflective Questions

Regarding the elements of the reflective questions it can be concluded that they were present and used in different ways by PLC's. In some cases evidence was found for all the reflective questions and in some it lacked evidence for particular questions. Regarding the use of the reflective questions, some questions seem to fulfil a more practical role leaving the conversation at a less deep level than the use of the reflective questions intend. Since less depth in conversations is seen to occur (Schildkamp et al., 2016; Brown, 2017; Brown et al., 2017; Brown & Flood, 2018) the reflective questions must be used to gain more depth in a PLC's conversation. These reflective questions can be used to describe a situation, explain the occurrence of a situation, and to reason why it occurred as a reflection-on-action (Schön, 2017). In addition to that, it seemed that sometimes the more practical questions were asked in the phase of diagnosis and evaluation. In the diagnosis phase the reflective questions were applied in order to establish the PLC. This applied to the context to which the intervention of the PLC will take place, what ideal situation the PLC wanted to bring about with the intervention, hence what the PLC wanted to achieve and which limiting factors might influence the process of designing and executing the intervention. Thus, the reflective questions were applied to define the PLC. Here, the reflective questions serve a more practical purpose, but also serves the angle of reflection as proposed by Schön (2017). And, also as in the used definition (see section 4.2, p.7), where it is used to clarify practice, explain underlying views, exchange and develop knowledge and to enhance understanding and problem-solving to eventually improve student learning.. For example, the questions were used to describe the current situation, thus clarify the practice, and to reason, thus explain for example underlying views and explain why the situation needs to be changed, hence the intervention. As such, the reflective questions were used as intended in the diagnosis phase.

During the design phase, there seemed to be more room for reflective questions as intended, when used in the conversations of the PLC especially in Case #2 and #4. This concerns the actions and thoughts of the teachers and complementary to that the effect on the students as well. For example, when after the lesson the situations occurring herein were discussed. Here the questions were used to explain the teachers' actions and contemplating for example how it could be done the next time in order to clarify practice and solve problems. Thoughts of the teachers were considered in such a way that thoughts during an activity, reflection-in-action (Schön, 2017), were discussed when reflecting-on-action (Schön, 2017). This is both considered regarding the effect on the students and this was sometimes contemplated as well. Thus, in such a way, the questions were used as intended in the design phase.

Moreover, the reflective questions were also seen in the design phase when the data was gathered for the evaluation phase at the same time as the intervention was executed. Here, the teachers contemplated the actions, thoughts, feelings, students etcetera, but were as such not always part of the PLC conversations until the evaluation phase. In that sense, the reflective questions were not used as intended, because they were assumed to be present in the conversations of the PLC for reflective dialogue to exist and a PLC to be effective. However, it contributed to reflection-on-action as the teachers and students are asked to think about the situation whilst the intervention is executed. Although, this ultimately is used in the PLC's conversation in the evaluation phase.

Successively, for the evaluation phase in three of the four cases, when reflective questions were used, they were mostly used in the data where they are used in a more practical way, for example in the questionnaires. Here they contribute to the overall results of process and product. However, the data and thus the reflective questions used herein are used to clarify practice and explain underlying views regarding the intervention. And, were as such discussed. In the remaining case #4 evaluation presented another form. This PLC evaluated the execution of the design immediately in the conversation when the PLC meets. When evaluation took place, the questions used, were used as intended according to Schön (2017) and the used definition as they were used to describe a situation;

clarify practice, for example what happened in the classroom after asking questions to students and the effect it seemed to have on the students. Also, the PLC-members used the questions to reason why a situation happened and what needs to be done differently the next time; explain underlying views, share knowledge and solve occurring problems.

Contributing to the finding/conclusion that the reflective questions sometimes seemed to be used in a more practical way, one particular question was not opted for by many. This question related to feelings. As the use of the other questions already seem to be twofold: practically (less deep level) and used to clarify practice, explain underlying views and maybe revise these views, to share knowledge for further development, and to solve problems (deep level) this might be considered as a more deep aspect of reflection. Feelings might also be something that cannot be labelled as easy as actions and thoughts. In addition to that, reflection requires higher level thinking skills which one must possess for reflection to be effective (Yost, Sentner & Forlenza-Bailey, 2000), which might explain the occurrence that the reflective questions are not always used as intended, as these skills might be difficult to achieve.

To finalize on this sub question, a couple of questions are interpreted by the teachers during the entire process of the research and are only at the end substantiated by the students. For example when conducting a questionnaire and participating in the focus group. In that way, the creation of a different view or approach is not substantiated by data or literature. Thus, decisions made based on interpretation might not be as effective, than substantiating these interpretations and then making a decision (Van Geel et al., 2016; Schildkamp et al., 2017).

7.3 The elements of Reflective Subjects

Considering the third sub question regarding the reflective subjects it can be concluded that these were present in three of the four cases for every phase, and that they were used in several ways by the different PLC's. Case #4 only used it in diagnosis and the design phase. In the diagnosis phase, the reflective subjects seemed to be used as intended: these subjects should be applied as a guideline to which questions could be asked that relate to reflection (Pauw et al., 2017). For example, the reflective subject of *whom,* the students, might lead to a question of which students should be part of the intervention design and more reflective why these should students be chosen. Then, the subject leads to a question related to reflection as it reasons for a decision (Schön, 2017). Thus, the use of the reflective subjects in this phase is coherent to its intended use in a conversation of a PLC as to reflective dialogue. This is seen in that the PLC's reason about the subjects that are present in order to for example clarify practice in the diagnosis phase, and for example it was reasoned for by explaining and discussing underlying views what students should participate in the intervention, or how particular personalities of the PLC-members as teachers could contribute to designing the intervention.

However, in the design phase, similar to the reflective questions, the subjects seemed to fit the more practical part of the PLC's meetings. It was specifically used as a subject for the design and implementation criteria or in the data. This was seen in the connection with the elements that can be made in the CPOs. As such, the reflective subjects were not used as intended. It could be explained that within the cases the subjects seem to be used more practically. The reflective subjects, in contrast with the reflective questions, might provide more room for interpretation how to use it in a conversation. Therefore it might prove to be more easy to deploy during the PLC meetings in a more practical sense in the design phase.

In the evaluation phase, the subjects were considered in both ways. On the one hand it was used in a practical sense. For example, when *who,* the teachers were considered as the executioners of the intervention. And, on the other hand, when *does* was translated in the gathered data to the actions of the teachers and/or students. Here the questions asked or statements presented are related to reflection as these questions poses the teacher or the student to think about actions, thoughts, feelings,

and effects. In this way the subjects are used as intended as reflection is when a person revisits a situation (Korthagen & Vasalos, 2005; Schön, 2017), clarifying the practice and explain the underlying view and discussing this and simultaneously share knowledge in order to solve for example an occurring problem.

7.4 The engagement of Reflective Dialogue in a PLC meeting

Then, finally, the main research question of this research "How do PLC's engage in reflective dialogue?" can be answered in the following way. Experience, data and literature showed to be input of the conversations. Experience and literature also showed to be used as support in creating an alternative view or approach. Literature and experience were part of the design of a new approach as it was considered an important way to support the decision of what was used. Thus, the PLC's engaged in a conversation based on experience, literature and self-collected data. There was much evidence for reflective dialogue as in many cases reflective questions and subjects appeared to be used as intended overall in the entire process of the PLC's. However, they were used in different ways during the diagnosis, design and evaluation phase. During the phases different reflective questions and subjects appeared to be used. As such, every phase was distinguished by its own appearance of particular reflective questions and subjects. When there was an overlap of reflective questions and subjects in the phases it appeared that the reflective questions or subjects served a different purpose/angle in every phase. For example, what the students did is in the design phase used to verify the students actions in a particular lesson e.g. that it was noticed that a student was absent in his/her attention. While, in the evaluation phase this reflective question is translated to what did other students do during the pre-teaching in for example case #2. This overlap and different use of the same reflective questions and subjects might be explained in the following way. The particular reflective questions and subjects were part of the design criteria, but were also subject in the conversations for change and contribution to this change as well, e.g. the students actions, feelings and thoughts as the intervention aims at improving the situation for them for optimizing their achievements. They also seemed to be part of the data that was gathered during the intervention to evaluate its effectiveness and therefore considering these elements. In the evaluation phase these reflective questions and elements returned in the conversation as the data results were discussed.

In some cases the reflective questions and subjects were mostly used between members of the PLC and not per se during the PLC meetings, for example discussing a lesson in the classroom, hallway or schoolyard with another PLC member outside of the PLC meetings. Therefore, it needs to be considered that the conversations not only took place in the PLC meeting. In addition to that, sometimes these conversations were transferred to the PLC meeting. And forms input into the conversations of the PLC. As such, the "duo" conversation became a shared conversation in the PLC where it became owned by the PLC. This can be considered as an added value to the PLC where sharing knowledge is an important factor.

Regarding factors influencing PLC's according to the literature it seemed in some cases that *time* was a very important factor that is the foundation on which a PLC exists. This factor is mentioned several times within the interviews and the documents. This also goes for the condition *shared vision*. This was also mentioned as not present in some of the PLC's and the entire school at the beginning of the process. Therefore, in some PLC's, it was also the focus of the PLC to determine the vision for both the PLC and the school as a whole. The focus needed to be determined at first, and because of this the PLC's concerned might not have been able to maximize their effects. Also, it seemed that in one particular case the process of becoming a PLC ran parallel to the process of designing the intervention. Thus, the factors considered to be necessary for an effective PLC are sometimes not present in such a way that the PLC benefits from it. This intervenes with the ability of the PLC to optimize its effectiveness in order to improve student achievement.

To conclude on the main research question: The PLC engages in reflective dialogue during the three phases of diagnosis, design and evaluation. It was initiated by experience, data and literature. The reflective questions and subjects were used in all the phases for three cases. The fourth case used in the diagnosis and design phase. Sometimes they served a different purpose in the phases. They also functioned reflective and/or practical, as they were used to clarify practice, explain underlying views, share the knowledge regarding the questions and subjects and to solve problems in order to improve student learning and/or to determine the questions and subjects related to the application in practice. It led to an alternative view and/or approach especially in the diagnosis and design phase. Experience, data and literature also contributed to a change in view and/or approach. The contribution to another view and/or approach was seen because it provided different insights regarding the subject of the intervention and its effectivity on student performance.

7.5 Implications for Practice

Due to the effectiveness of the interventions designed by the PLC's seemed to have on their student achievement the implication for practice is that the PLC's benefit from the role experience, literature and data plays and the interaction between them. It is important for existing and upcoming PLC's to use both literature and data next to experience: to diagnose a problem, design an intervention and evaluate the intervention. It might be helpful for the PLC's to also search for literature that provides models for collective research or design as were used by the MLI students and their PLC's. This provides them with a framework to base the process of the PLC upon. From this framework the use for literature and data is opted for in the different stages of the process. The focus of this research was to see in what way the PLC's engage in reflective dialogue. The conclusion that reflective dialogue was present in all the different phases of diagnosis, design and evaluation, because of the presence of the elements of reflective questions and subject and that they were used as intended to clarify practice, explain underlying views, share knowledge to improve and solve problems to eventually improve student learning, leads to the following implication for practice.

It is shown by this research that the presence of reflective dialogue runs parallel to a positive effect of the intervention design on student achievement for every case. Yet, some PLC's showed less effect of the intervention than the other PLC's. The PLC which showed less effect, seemed to use the reflective questions in a more practical way than for example the PLC in case #2. Thus it is suggested to use reflective dialogue during all the phases as proposed in this research of designing an intervention with the intent to improve student achievement. Experience, data and literature can be used to reflect upon by the PLC members during all the phases. This research provides reflective questions and subjects which can be applied by other PLC's as well. These can be used as a guideline for reflection and when used in a conversation for reflective dialogue. It forms a basis to start from and for a PLC to find their own way in shaping their own reflective dialogue. It is important to consider to firstly describe a situation, thus clarify the practice and explain underlying views by actions, thoughts and feelings and to do it similarly for the students. Regarding the students it is suggested to substantiate this with data. For example, use a short questionnaire that records the students' actions, feelings, thoughts and what effect the students think it has on them. This can be compared to the teachers' experiences with the situation. Because of this, the teachers' experience can be supported or rejected. By making optimal use of evidence to back up the experience a well informed decision can be made to change a view or approach. Most important is that reflective dialogue is being used by the PLC as it provides them with the opportunity to clarify and verify their practices. Also when the data contradicts the experience of the teachers reflective dialogue can be used to explain the underlying views whereby experience and literature can be used to explain this occurring discrepancy as the PLC then operates in an evidence-informed way (Brown et al; 2017; Brown & Flood, 2018).

7.6 Limitations & Recommendations for future research

What needs to be taken into consideration is the fact that this research tried to provide a framework of what reflective dialogue could look like in PLC's that were self-rated by teachers as scoring relatively high on sub-scales related to reflective dialogue. Reflection is a very abstract, meta cognitive activity (Grant, 2001; McAlpine & Weston, 2002; Desautel, 2009) and there might not be one way to stress how to reflect. There are more ways to reflect and as such the questions opted for in this research might not correspond entirely to the PLC meetings and even the PLC-members. Therefore it is proposed for future research to expand the amount of reflective questions. With regard to the reflective subjects it is proposed that a clear distinction is made between the practical side of the use of the subjects and the more reflective application of the subjects.

Within the design of the interview less attention was spend on the individual reflective questions and subjects. Therefore it was considered difficult to trace back the presence of these individual questions and subjects. Because of the difficulty experienced with it, it is opted for future research to ask for the particular questions to be present. And, extra important, to ask for examples of how the possible presence of the questions and subjects are used by the PLC members.

During the conducting of the interviews the border between answering in the context of the whole school relative to answering in the context of the PLC seemed to be difficult for both the interviewer as the interviewee as well. Therefore, it was considered difficult sometimes to filter out whether the information from the interview could be particularly related to the PLC. For future research it is recommended that this boundary is taken into consideration, by for example visiting several PLC meetings, recording these meetings and transcribing them. In that way, the researcher is present at the moment the conversations take place and does not have to rely on what the PLC members might remember what is being discussed during a PLC meeting.

Another consideration is that this research focused on PLC's within the context of the KPZ. These PLC's might differ from other PLC's regarding their composition. The PLC's established from the Master Learning and Innovation aim at constructing an intervention design and doing a collective research simultaneously. Therefore, the role literature and data plays in these particular PLC's might differ from the role it plays in other PLC's outside of the context the KPZ provides. From the educational setting these particular PLC's are established, literature is necessary to be used by the PLC during the whole process of the CPO. Data also needed to be gathered as it was a collective research. With regard to the effectiveness of the PLC's, they all seem to contribute to some extent to student improvement. Therefore, it is very interesting for future research to see what role data and literature play in other PLC's without the context of an educational setting as in the Master of Learning and Innovation. Then, the future research contributes to the extent to which data and literature play a role (inter)nationally. This research shows that the use of literature and data, next to experience contribute to the effectiveness of the intervention on student performance.

From the notion that the PLC's in this research might differ in their composition, due to the reason for its establishment (the educational setting and the compulsory nature of the assignments for what the PLC's are needed), the selecting of the participants need to be taken into consideration.

The (small) sample size that was available consisted of the PLC's that were led by a teacher leader whom is educated in the Master Learning and Innovation. These particular PLC's were established for the compulsory assignments of the MLI students. Therefore the sample size was reduced to the number of teacher leaders and their PLC's. Therefore, it might have been more difficult to select more than four cases for the research and find participants that were able to participate. In addition, selection is based on a questionnaire which scores the self-perception of the teachers regarding reflective dialogue. For future research it might be important to sample more than four participants taking this limitation into account when conducting future research in the context of an educational setting.

8. References

Blankenship, S. S., & Ruona, W. E. (2007). Professional Learning Communities and Communities of Practice: A Comparison of Models, Literature Review. *Online Submission*.

Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative research journal*, *9*(2), 27-40.

Brown, C., Schildkamp, K., & Hubers, M. D. (2017). Combining the best of two worlds: a conceptual proposal for evidence-informed school improvement. *Educational research*, *59*(2), 154-172.

Brown, C., & Flood, J. (2018). Lost in translation? Can the use of theories of action be effective in helping teachers develop and scale up research-informed practices?. *Teaching and Teacher Education*, *72*, 144-154.

Bruns, M. & Bruggink, M. (2015). Starten met een Professionele LeerGemeenschap. PLG-teams in het onderwijs. Rotterdam: Bazalt.

Castelijns, J., Koster, B., & Vermeulen, M. (2009). *Vitaliteit in processen van collectief leren.* Antwerpen / Apeldoorn: Garant.

Darling-Hammond, L., & McLaughlin, M. W. (2011). Policies that support professional development in an era of reform. *Phi delta kappan*, *92*(6), 81-92.

De Caluwé, L. (2003). *Denken over veranderen in vijf kleuren.*

Hord, S. M. (Ed.). (2004). *Learning together, leading together: Changing schools through professional learning communities*. Teachers College Press.

Hord, S. M., Abrego, J., Moller, G., Olivier, D. F., Pankake, A. M., & Roundtree, L. (2010). *Demystifying professional learning communities: School leadership at its best*. R&L Education.

Katz, S., O'Donnell, G., & Kay, H. (2000). An approach to analysing the role and structure of reflective dialogue. *International Journal of Artificial Intelligence in Education (IJAIED)*, *11*, 320-343.

Korthagen, F., & Vasalos, A. (2005). Levels in reflection: Core reflection as a means to enhance professional growth. *Teachers and teaching*, *11*(1), 47-71.

Lee, D., Hong, H., Tay, W., & Lee, W. O. (2013). Singapore Professional Learning Communities in Singapore Schools. *Journal of Co-operative Studies*, *46*(2), 53-56.

Lomos, C., Hofman, R. H., & Bosker, R. J. (2011). Professional communities and student achievement–a meta-analysis. *School Effectiveness and School Improvement*, *22*(2), 121-148.

Murdaugh, E. C. R. (2017). *Promoting a Culture of Collaboration and Reflection through a Professional Learning Community* (Doctoral dissertation, University of South Carolina).

Olivier, D. F., Hipp, K. K., & Huffman, J. B. (2010). Assessing and analysing shools. In K. K. Hipp & J. B. Huffman (Eds.). Demystifying professional learning communities: School leadership at its Best. Lanham, MD: Rowman & Littlefield.

Pauw, I., van Lint, P., Gemmink, M., Jongstra, W., & Pillen, M. (2017). *Een leraar als geen ander* (1e ed.). Antwerpen – Apeldoorn. Garant – Uitgevers n.v. ISBN: 978-90-441-3513-8.

Prenger, R., Poortman, C. L., & Handelzalts, A. (2017). Factors influencing teachers' professional development in networked professional learning communities. *Teaching and teacher education*, *68*, 77-90.

Reichstetter, R. (2006). Defining a professional learning community. *E & R Research Alert*, (06.05).

Schaap, H., & de Bruijn, E. (2017). Elements affecting the development of professional learning communities in schools. *Learning Environments Research*, 1-26.

Schildkamp, K., Poortman, C. L., & Handelzalts, A. (2016). Data teams for school improvement. *School effectiveness and school improvement*, *27*(2), 228-254.

Schleicher, A. (2012). Preparing teachers and developing school leaders for the 21st century: Lessons from around the world. rue Andre Pascal, F- 75775 Paris Cedex 16, France: OECD Publishing. 2.

Schön, D. A. (2017). The reflective practitioner: How professionals think in action. Routledge.

Sim, J., & Wright, C. C. (2005). The kappa statistic in reliability studies: use, interpretation, and sample size requirements. *Physical therapy*, *85*(3), 257-268.

Spanneut, G. (2010). Professional learning communities, principals, and collegial conversations. *Kappa Delta Pi Record*, *46*(3), 100-103.

Spin, L. (2016). *We laten leerlingen niet los, we houden ze anders vast.* Zwolle: Katholieke Pabo Zwolle.

Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional learning communities: A review of the literature. *Journal of educational change*, *7*(4), 221-258.

Thompson, G. N., Estabrooks, C. A., & Degner, L. F. (2006). Clarifying the concepts in knowledge transfer: a literature review. *Journal of advanced nursing*, *53*(6), 691-701.

Van Geel, M., Keuning, T., Visscher, A. J., & Fox, J. P. (2016). Assessing the effects of a school-wide data-based decision-making intervention on student achievement growth in primary schools. *American Educational Research Journal*, *53*(2), 360-394.

Vescio, V., Ross, D., & Adams, A. (2008). A review of research on the impact of professional learning communities on teaching practice and student learning. *Teaching and teacher education*, *24*(1), 80-91.

Yoon, K. S., Duncan, T., Lee, S. W. Y., Scarloss, B., & Shapley, K. L. (2007). Reviewing the Evidence on How Teacher Professional Development Affects Student Achievement. Issues & Answers. REL 2007-No. 033. *Regional Educational Laboratory Southwest (NJ1)*.

Yost, D. S., Sentner, S. M., & Forlenza-Bailey, A. (2000). An examination of the construct of critical reflection: Implications for teacher education programming in the 21st century. *Journal of teacher education*, *51*(1), 39-49.

9. Appendices

9.1 Appendix I: Sub scales PLC questionnaire

	Collectief leren en toepassing van het geleerde	Helemaal mee oneens	Mee oneens	Mee eens	Helemaal mee eens
20	Het team werkt samen aan het vergroten van zijn kennis en vaardigheden en het ontwikkelen van strategieën.	O	O	O	O
21	Het team past het geleerde toe in de beroepspraktijk.	O	O	O	O
22	Het team organiseert en werkt samen om oplossingen te vinden voor diverse behoeften van de leerlingen.	O	O	O	O
23	Er bestaan diverse mogelijkheden en structuren voor collectief leren via open dialoog.	O	O	O	O
24	De dialoog tussen teamleden wordt gekenmerkt door respect voor verschillende ideeën die collectief leren stimuleren.	O	O	O	O
25	De professionele ontwikkeling is gericht op lesgeven en leren.	O	O	O	O
26	Het team en de ouders leren samen en passen de nieuw verkregen kennis toe bij het oplossen van problemen.	O	O	O	O
27	Het team is nauw betrokken bij programma's die de leerervaring verbeteren.	O	O	O	O
28	Het team analyseert samen verschillende gegevensbronnen om de effectiviteit van onderwijspraktijken te beoordelen.	O	O	O	O
29	Het team analyseert samen het werk van leerlingen om het onderwijs en de leerprestaties te kunnen verbeteren.	O	O	O	O
E	De MLI heeft bijgedragen aan de ontwikkeling van collectief leren en toepassing van het geleerde.	O	O	O	O
		checkbox (max. 3)			

	Het delen van de persoonlijke onderwijspraktijk	Helemaal mee oneens	Mee oneens	Mee eens	Helemaal mee eens
30	Het team wordt in de gelegenheid gesteld collega's te observeren en in hun werk te stimuleren.	O	O	O	O
31	Teamleden geven elkaar feedback met betrekking tot de onderwijspraktijk.	O	O	O	O
32	Het team wisselt onderling ideeën uit over hoe ze de leerprestaties van de leerlingen kunnen verbeteren.	O	O	O	O
33	Het team beoordeelt samen het werk van leerlingen om de persoonlijke onderwijspraktijk te delen en te verbeteren.	O	O	O	O
34	Het team heeft toegang tot coaching en begeleiding.	O	O	O	O
35	Het team wordt in de gelegenheid gesteld wat ze geleerd hebben toe te passen in de onderwijspraktijk en de resultaten te delen met elkaar.	O	O	O	O
36	Het team wisselt regelmatig onderling het werk van leerlingen uit om de onderwijspraktijk op school te verbeteren.	O	O	O	O
G	De MLI heeft bijgedragen aan de ontwikkeling van het delen van de persoonlijke onderwijspraktijk.	O	O	O	O
H	Welke van de hierboven genoemde stellingen is het sterkst beïnvloed door de MLI?	checkbox (max. 3)			

	Ondersteunende voorwaarden – Structuren	Helemaal mee oneens	Mee oneens	Mee eens	Helemaal mee eens
42	Er wordt tijd vrijgemaakt om de onderlinge samenwerking te verbeteren.	O	O	O	O
43	Het schoolrooster stimuleert collectief leren en het delen van de persoonlijke onderwijspraktijk.	O	O	O	O
44	Het team heeft de beschikking over de benodigde technologie en lesmethoden.	O	O	O	O
45	Externe deskundigen leveren expertise en ondersteunen het proces van onderwijsverbetering.	O	O	O	O
46	De leeromgeving is schoon, uitdagend en uitnodigend.	O	O	O	O
47	Informatiesystemen bevorderen de uitwisseling van informatie tussen het team.	O	O	O	O
48	Informatiesystemen bevorderen de uitwisseling van informatie tussen betrokkenen bij de school.	O	O	O	O
49	Gegevens zijn geordend en goed toegankelijk voor het team.	O	O	O	O
K	De MLI heeft bijgedragen aan de ontwikkeling van structuren (als ondersteunende voorwaarde).	O	O	O	O
L	Welke van de hierboven genoemde stellingen is het sterkst beïnvloed door de MLI?	checkbox (max. 3)			

9.2 Appendix II: Interview

Interview

Introductietekst:
Van harte welkom. Ik wil jullie alvast heel hartelijk bedanken voor het meewerken aan mijn onderzoek. Zoals ik al had aangekondigd ga ik jullie een aantal vragen stellen die gaan over "het gesprek" in jullie Professionele Leergemeenschap.

Met jullie toestemming wil ik graag dit interview opnemen, zodat ik dat naderhand kan uittypen. Deze transcriptie wordt alleen gebruikt ten behoeve van mijn onderzoek en jullie opnamen worden vertrouwelijk verwerkt. Ook wil ik aangeven dat jullie ten allen tijde dit interview stop kunnen zetten. Jullie bijdrage is dan ook geheel vrijwillig en de resultaten worden anoniem verwerkt in het verslag.

Toestemmingsformulier

Hebben jullie naar aanleiding hiervan nog vragen? (Doorstrepen wat niet van toepassing is)
Respondent #1: [JA – NEE]
Respondent #2: [JA – NEE]

Gaan jullie akkoord met het opnemen van dit interview?
Respondent #1: [JA – NEE]
Respondent #2: [JA – NEE]

Gaan jullie akkoord met het anoniem transcriberen en gebruiken van dit interview?
Respondent #1: [JA – NEE]
Respondent #2: [JA – NEE]

Handtekening:		*Datum: ____ - ____ - 2018*
Respondent #1:	*Respondent #2:*	*Interviewer:*
_____	_____	_____

Algemeen

Allereerst zou ik graag wat meer willen weten over hoe de professionele leergemeenschap er bij jullie uitziet. Op die manier kan ik een beeld schetsen van jullie PLG en heb ik wat meer achtergrondinformatie.

Hoe ziet de Professionele Leergemeenschap er bij jullie uit?

- Hoeveel mensen nemen deel aan jullie PLG?
- Hoe zijn jullie ingedeeld? [*Bijvoorbeeld; per leerjaar]*
- Wat zijn de functies in jullie PLG?
- Wat is het thema en doel van jullie PLG?

Waar gaan de gesprekken tijdens jullie bijeenkomst over?

Op welke manier bespreken jullie de onderwerpen met elkaar?
[Denk hierbij bijvoorbeeld aan: vragen stellen aan elkaar wat betreft vorderingen of belemmeringen?]

Wanneer delen jullie (voornamelijk) kennis met elkaar?

Op welke manier maken jullie gebruik van elkaars kennis en vaardigheden?
[*Bijvoorbeeld: We leren van elkaars kennis en vaardigheden. We proberen andermans kennis en vaardigheden toe te passen.*

[Voorbeeld verdiepende/verduidelijkende vraag:
Op welke manier wordt er gebruik gemaakt van deze ervaring van andere collega's?
[*Bijvoorbeeld: Het aanbieden van alternatieve methoden om hiermee om te gaan. Het bespreken van essentiële aspecten die ten grondslag kunnen liggen aan de gebeurtenis (denk hierbij aan: de tijd van de dag/jaar – temperatuur etc.]*

Reflectieve Dialoog

In deze sectie zou ik graag wat meer willen weten over de gesprekken in jullie PLG.

Hoe komen de gesprekken over het algemeen op gang? Wat is de aanleiding?

Elementen tabel 1
Welke activiteiten werden besproken?
Op welke manier kwam het doel terug?
Hoe wordt er gekeken naar wat jullie wilden bereiken?
Op welke manier komt aan bod wat jullie deden tijdens een activiteit?
Hoe wordt er gekeken naar wat jullie dachten tijdens de activiteit?
Hoe wordt er gekeken naar wat jullie van de activiteit vonden?
In hoeverre speelt de omgeving een rol? Hoe speelt deze een rol in jullie gesprekken?
[*Bijvoorbeeld: in wat voor een context vonden de activiteiten plaats?]*
Op welke manier worden de leerlingen betrokken in het gesprek?
[*Daarmee bedoel ik: in hoeverre wordt er gekeken naar wat de leerlingen tijdens een activiteit wilden bereiken/ wat ze deden / wat ze dachten / wat ze voelden?]*

Elementen tabel 1 – 2a – 2b

Wat voor soort vragen worden er aan elkaar gesteld? [*Bijvoorbeeld: Wat deden de leerlingen op dat moment? Waarom zouden ze dat doen? Wat wilde jij ermee bereiken? Wat voor een gevoel had jij of je studenten erbij? Etc.]*

- Welke onderdelen komen aan bod tijdens het stellen van vragen?
  [*Bijvoorbeeld: Van wat voor een instructievorm maakte je gebruik: bijv. groepsdiscussie/individuele opdracht? Wat voor een onderwerp werd er besproken: bijv. rekenen/taal/aardrijkskunde? Hoe laat was dat? Welke hulpmiddelen gebruikte je: bijv. TV/ICT etc.? Worden bevorderende en belemmerende factoren besproken?*
- Gaan jullie tijdens zo'n gesprek bij elkaar na wat voor redenen ten grondslag kunnen liggen aan de gebeurtenis?
  En zo ja: Op wat voor manier doen jullie dit?
  En zo nee: op wat voor manier proberen jullie te duiden hoe de gebeurtenis is ontstaan?

Elementen Model

Wat gebeurt er naar aanleiding van het gesprek? [*Bijvoorbeeld: Er wordt gekeken naar een ideale situatie en hoe deze bereikt kan worden→ wat kan er de volgende keer anders worden gedaan door de leraar, zodat er een ideale situatie ontstaat.*

Data

Voor deze sectie wil ik graag meer weten over het gebruik van data. Onder data wordt verstaan: Alles wat vastgelegd is/kan worden wat betreft cijfers van leerlingen – achtergrondinformatie van leerlingen – prestaties bij formatieve opdrachten – profilering van leerlingen etc.

In hoeverre zijn gesprekken tijdens een bijeenkomst gebaseerd op data?
[*Bijvoorbeeld: Ligt data ten grondslag aan het gesprek, bijv: in data wordt een daling/stijging van cijfers opgemerkt. → op die manier wordt een gesprek gestart om te bepalen waarom deze daling/stijging aanwezig is.*

Wanneer geen gebruik wordt gemaakt van data: *Hoe zouden jullie het voor je zien als jullie wel gebruik zouden maken van data? Hoe zou data jullie kunnen ondersteunen?*

DATA: CIJFERS VAN LEERLINGEN | ACHTERGROND INFORMATIE LEERLINGEN | PRESTATIES FORMATIEVE OPDRACHTEN | PROFILERING VAN LEERLINGEN ETC.

[*Bijvoorbeeld: Worden er vragen gesteld om de data te duiden, dus om een oorzaak/reden te vinden? Wordt er gekeken naar factoren zoals de structuur van de les/naar de soort leraar/naar de soort leerling/naar het onderwerp?*

Op welke manier wordt data gebruikt om een situatie/gebeurtenis te duiden?
[*Bijvoorbeeld: Bij het (h)erkennen van een probleem. Of: Bij het (h)erkennen van een vordering. Of: Het ondersteunen van een reden dat een gebeurtenis plaatsvindt/plaats heeft gevonden.*

DATA: CIJFERS VAN LEERLINGEN | ACHTERGROND INFORMATIE LEERLINGEN | PRESTATIES FORMATIEVE OPDRACHTEN | PROFILERING VAN LEERLINGEN ETC.

Wat voor een data wordt er zoal gebruikt?

Hoe waarderen jullie data (gebruik) in het algemeen?

Literatuur

In hoeverre zijn gesprekken tijdens een bijeenkomst gebaseerd op literatuur?
[*Bijvoorbeeld: het lezen van bepaalde literatuur ligt ten grondslag aan een gesprek om dit met elkaar te bespreken.]*

Wanneer geen gebruik wordt gemaakt van literatuur: *Hoe zouden jullie het voor je zien als jullie wel gebruik zouden maken van literatuur? Hoe zou dat jullie kunnen ondersteunen?*

Op welke manier wordt deze literatuur dan besproken?
[*Bijvoorbeeld: Wordt er gekeken naar hoe de literatuur bij kan dragen aan de educatie van de school? Past dit wel of niet bij de visie van de school? Wordt er gekeken naar hoe leraren dit kunnen toepassen?*

Op welke manier ondersteunt het gebruik van literatuur jullie tijdens een bijeenkomst?

Op welke manier wordt literatuur gebruikt om een situatie/gebeurtenis te duiden?
[*Bijvoorbeeld: Wordt het gebruikt om een probleem of vordering te (h)erkennen? Of wordt het toegepast in een gesprek om een reden of oorzaak te duiden. Wordt het gebruikt om essentiële aspecten te ontdekken die bijdragen aan een gebeurtenis? Of om essentiële aspecten te ontdekken die bijdragen aan het bedenken van een alternatieve methode om een ideale situatie te kunnen bewerkstelligen?]*

Wat voor een literatuur wordt er zoal gebruikt?
[*Bijvoorbeeld: wetenschappelijke literatuur, vakbladen, theoretische literatuur, toepassingsliteratuur etc.]*

Hoe waarderen jullie literatuur (gebruik) over het algemeen?

9.3 Appendix III: Code Scheme

General Codes		
Code	***Description***	***Example***
PLC - Originate	The description of how the PLC is established	e.g. *within our PLC we discussed …*
PLC - Number	The number of people (members) in the Professional Learning Community (PLC)	e.g. *Our PLC exists of 5 members*
PLC – Number of PLC meetings	The number of meetings in the PLC	e.g. *We met 10 times this years*
PLC – Function	The function of members in the PLC	e.g. *In our PLC there are 3 teachers, one IB'er and one principal*
PLC – Division	The division of the members in the PLC	e.g. *Our PLC has two teachers from grade 4 and one from grade 5*
PLC – Theme	The theme of the PLC	e.g. *The theme of our PLC is mathematics*
PLC – Goal	The goal of the PLC	e.g. *Our goal is to implement a new instruction method for mathematics*
PLC – Subjects	The subjects that are being discussed in the PLC	e.g. *We talk about … (*element table 1, 2a, 2b)
PLC – Sharing Knowledge	The sharing of knowledge in the PLC	e.g. *People refer to "well I have always done it like this, maybe we should…"*
PLC – Use of Knowledge & Skills	The use of each other's knowledge and skills (to learn from)	e.g. *We use each other's knowledge and skills as input for a design*
PLC – Use of experience	*The use of each other's experience in order to …*	e.g. *We used the experience of a colleague to decide what to do next*
Reflective dialogue		
Code	***Description***	
Experience	The mentioning of an experience that is input for a conversation during the meeting of the PLC	
Data	The mention of data that is input for a conversation during the meeting of the PLC	
Literature	The mentioning of literature that is input for a conversation during the meeting of the PLC	
Reflection	Thinking about (a) situation(s) that lingers in one's mind	
Activities	The mentioning of activities that are being discussed during the meeting of the PLC	
Goal	The mentioning of the goal that is being discussed during the meeting of the PLC	
Accomplishment	The mentioning of what the PLC wants to accomplish	
Actions	The mentioning of actions during an activity in the meeting of the PLC	
Thoughts	The mentioning of 'thinking' or 'thoughts' during the meeting of a PLC	

Opinion	The mentioning of an opinion about an activity during the meeting of a PLC
Environment	The mention of the environment (as an influencing factor) during the meeting of a PLC
Students	The mentioning of (the involvement of) students during the meeting of a PLC
Code	***Description***
Question	The mentioning of (asking) questions during the meeting of a PLC (also with regard to table 1)
Components	The mentioning of the subjects in table 2a and 2b
Reason/Cause	The mentioning of reasons/causes during the meeting of a PLC
Follow-up	The mentioning of what happens in response to the conversation
DATA	
Code	***Description***
Data – General	The mentioning of the use of data in general
Data – PLC	The mentioning of the use of data within the PLC
Data – indication	The use of data to indicate the occurrence of a situation
Data – Source	The use of data as a source to support further actions
Data – Types	The mentioning of which type of data is being used by the PLC
Data – Appreciation	The appreciation of data (use) in general
LITERATURE	
Code	***Description***
Literature – General	The mentioning of the use of literature in general
Literature – PLC	The mentioning of the use of literature within the PLC
Literature – Part	The way literature is being used by the PLC as a part of their conversations
Literature – Support	The mentioning of literature as a support for the PLC
Literature – Indication	The use of literature to indicate the occurrence of a situation
Literature – Types	The mentioning of the types of literature that are being used by the PLC
Literature – Appreciation	The appreciation of literature (use) in general