Teaching Teachers: A Look Inside Professional Development

by

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Abstract

Extensive research has been conducted on student learning, and pre-service teacher learning inside the classroom, but this is not the case with in-service teachers engaged in learning opportunities provided by professional development.

In this study a framework was developed to analyze and provide a description of a professional development session as it occurred. The researcher makes use of the phenomenological perspective, to analyze the 'lived experience' of professional development sessions and describe teachers' reactions to a variety of approaches and activities.

As a result of her analysis of professional development sessions, the researcher brings forward some important elements to consider like mood, motives, wants, and who is carrying the flow of the conversation (flux) during the sessions. The researcher also focused on engagement, and how, through engagement, teachers show their motivation, wants, moods, needs and learning.

To represent the phenomenology of professional development in a way that was succinct and useful, the researcher developed the idea of scenarios for her analysis. A scenario is defined as a unit of exchange, where the professional developer has a plan, and in accordance with it, s/he introduces or presents an idea or task. This action is taken in by the teachers, and the teachers then respond. Communication is not perfect, the original idea passes through the teachers' 'wants-motives-mood' filter, so what the teachers take out of what the professional developer presents to them is not necessarily what the professional developer expects, given that the response the professional developer receives also passes through her/his 'wants-motives-mood' filter. The unit is completed when the professional developer takes in the response and sees a need to re-direct. By dividing activities into scenarios, and then focusing on each of its components, the analysis was considerably simplified. The researcher was able to find units of meaning, and significant themes emerged from the analysis: how teachers use the teacher guides, how previous practice can play a role for change, and how a teacher's resistance can interfere with the learning of others.

Dedication

To my husband: Alejandro Adem

To my children and their families:

Rodrigo, Manal and Elias

Martha and Nico

To my parents: Alfonso and Melania

To my siblings: Alfonso y Rocío

To my cats and longtime companions: Tomasina and Che

"Teaching is not the Tao, the Tao can only be known by learning. Teachers are but one pearl on a sacred string. Not for themselves, but of themselves must they give."

Thomas M. White

From: Three Golden Pearls on a String

North Atlantic Books. Berkeley California 1991

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Chapter 1. Introduction

Changes in the provincial mathematics curriculum occur with some frequency and they affect teachers' efficacy in the classroom. To help teachers understand and work with the new material professional development workshops are generally the school districts' vehicle of choice. However, teacher professional development is one of the main challenges faced by many school districts as they lack the resources or adequate ways to address teachers' concerns about teaching a new curriculum, and consequently the paths towards the implementation of a new program are seldom coherent and clear (Ball, 1995, Jacob & Lefgren, 2002).

Despite research that shows that few teachers use much of what they learned in professional development sessions (Guskey, 2002), professional development is still viewed by policy makers, administrators and teachers as the main agent of change for improving teachers' practice and consequently, students' achievement (Strong, Fletcher, & Villar, 2004). Some teachers participate in professional development sessions either because it is required by their administration, or because there is a new curriculum being implemented, or to obtain college credit and a higher pay. Many others participate out of personal motivation, which in some instances can be because they perceive that what they are doing is not working and they are looking for something else that could work. When a new curriculum is being implemented, teachers usually want to find out how it fits with their current way of teaching, and how would it improve their practice (OECD, 2014).

There is also the reality that many teachers do not have the mathematical knowledge required to change their practice (Ball, 1995, Ma, 1999), and that the one-day or one-week workshop is not enough to support the necessary learning for this change to happen. In addition to having a series of workshops, I think that teachers also need time between these workshops to develop a deeper understanding of the mathematics as they reflect on the changes they are required to make in order to teach the new curriculum as

it is envisioned. A new curriculum or mathematics program often requires modifications in the focus of the practice. It may require that teachers change how they elicit conceptual thinking and understanding in their students; teachers need time and support for this to happen. It is common to see that all the parts involved in bringing about this shift in teachers' practice are brought about too hastily, and do not provide the necessary amount of time and communication needed for this transformation to happen.

At schools, teachers are the main harbingers of change, and they are the ones who, for the most part, are expected to convey the mathematical knowledge required at each grade level. In the end, the teachers are the ones that are going to set the effect that the professional development workshops will have in producing the necessary change. The professional developer can only provide support for change; it is the teachers who make the choice about whether or not to change their practice accordingly to what program developers envisage.

There is formal training for teachers, but most of the learning regarding their practice occurs while they are teaching (Yayli, 2009; Badertscher, 2007). Their development as teachers happens through noticing what happens in their classroom, and their students' engagement provides them with clues about their students' learning (Mason, 2011). I believe that the same applies for professional developers: significant learning about their practice occurs while working with teachers. Therefore, it is important to inquire about how professional developers learn to engage teachers in the learning process and what they notice about the teachers' reactions to specific activities during the session to further inform their practice.

There is no standard training or path to becoming a professional developer in mathematics education. When asked, professional developers provide a variety of stories of how they were led into this role. Some of them were mathematicians who became interested in education; some were mathematics teacher specialists; some mathematics education professors. In my case, I started helping at my daughter's school, as a volunteer teaching mathematics to gifted students. Then I was asked by the teachers to teach some of their mathematics classes. I had several conversations with teachers regarding mathematics and teaching of mathematics, and afterwards those conversations turned

into workshops with all of the teachers at the school attending. I have an undergraduate degree in mathematics and actuarial sciences from the National University of Mexico (UNAM), and a M.Sc. in Industrial Engineering from Stanford. At the time I was working for the University of Wisconsin-Madison at their Quantitative Assessment Project. Working for this project provided me with extensive experience in student mathematical assessment and a deeper knowledge of the university mathematical requirements for careers, not only in science and engineering, but also in the humanities. As I concurrently worked on this project at the university and helped the elementary school teachers at my daughter's school, I realized the great need for supporting mathematics teaching development in elementary schools to increase the students' prospects for success at the university. This got me started in the field of professional development.

Since there is no real training for professional developers in mathematics except for what experience brings, Deborah Ball (1995), advocates that those who teach teachers, including professional developers to take an inquiry and reflective position about what seems to work when they deliver professional development sessions: How and when is the professional developer able to navigate between the goals s/he had set for the session and the teachers' goals?

The goal of any professional developer is to find ways to promote in teachers what Rogers (1986) has labelled 'emancipatory learning', to help them find productive learning frameworks where they reflect, ask questions and try to figure out on their own how to make sense of the task at hand.

But how can this learning come about? What circumstances can provide the necessary synergy needed for this learning to happen?

Extensive research has been conducted on student learning, and pre-service teacher learning inside the classroom, but this is not the case with in-service teachers engaged in learning opportunities provided by professional development. As I was doing research regarding successful professional development, I found no descriptions about the lived experiences between professional developers and teachers. What I found were survey results from teachers' program evaluations, which provided information about teachers' individual perspectives on the effectiveness of professional development

sessions, or statistical analysis of school performances after the application of a particular professional development opportunity. Not much if anything has been done to show what happens during those learning opportunities and how, if at all, teachers' and professional developers' predispositions and the setting allowed for a fruitful learning opportunity (Garet, Porter, Desimone, Birman, & Yoon, 2001; Grammatikopoulos, Gregoriadis, Zachopoulou, 2013; Linder & Simpson, 2014). Also, I was not able to find any reflective studies conducted by professional developers in which they exposed and reflected not just on their successes, but also their failures. Making mistakes is a key component of the learning experience and not much has been provided by professional development research in this regard (McCartney 2016; Otterbach 2003). In order to find out what kind of interactions with teachers in a professional development setting will work, professional developers also need to be open to self-critical exploration.

In this thesis I explore the types of interactions with teachers that seemed to work and the types of interactions with teachers that didn't work. I am interested in the phenomenon of teachers' professional development, not in the abstract, but as it happens in the lived-in experience of this learning opportunity.

A Phenomenological Study

The goal of qualitative phenomenological research is to describe the lived- experience of a phenomenon, and to expose and identify phenomena from the perspective of the individual. The phenomenological approach is based in a paradigm of personal perspective, knowledge and interpretation and as such it is a vehicle for understanding subjective experience, and getting a better understanding of individual's motives and behaviour (Van Manen, 1990).

In this study, I describe different attempts on my part, as a professional developer, to engage teachers in the process of reading the manuals, discussing the use of the resources, the lessons, and the mathematical ideas contained in the lessons. This particular professional development was designed to support the implementation of a new mathematics program at a school.

This study provides a description of professional development as it occurred. I will denote some important elements to help develop a framework that could be useful as a tool to analyze real-life experiences between the professional developer and teachers during professional development sessions. How, for example, a professional developer attempts to set a learning opportunity in a particular way, with particular goals in mind, and how it actually unfolds.

Here is where the use of the phenomenological perspective seems to be quite suitable for the task, given that the purpose of this research is to find a way to analyze the 'lived experience' of professional development sessions and describe teachers' reactions to a variety of approaches and activities put forward by me, the professional developer, as I tried to engage them in various learning opportunities.

Since this research provides a phenomenological reflection on the interaction among teachers and the professional developer while opportunities for learning are provided, I focus on engagement and how, through engagement, teachers show their motivation, wants, needs and learning. I analyze and reflect upon the interplay between communication and different types of engagement between myself and the teachers, the teachers and the content of their learning. I want to find out how successful I was at negotiating and navigating between my motives behind the sessions, the goals I hoped to achieve, and the teachers' goals and motives for attending.

In my experience as a facilitator with a variety of professional development programs, I found that teachers' motives, wants and learning are usually exposed through the different modes or ways they engage. Research has also shown that the motives and wants that teachers bring into a professional development environment affect teachers' levels of engagement during the session (Liljedahl, 2014). Consequently, engagement is an indicator of wants and motives and vice versa.

The truth is that a professional developer can provide the same kind of session to a variety of groups, and it will work for some teachers but not for others. Sometimes when I read the literature I feel that I am only reading about infallible professional developers: where are their doubts? Did they miss something? What could they have done better? I have not been able to find descriptions by a professional developer of a case where s/he

felt that the session was not going as planned, and how s/he was or was not able to obtain the intended results and why. As I was reviewing the literature regarding professional development sessions, I found that these sessions were treated like a black box or an algorithm where a methodology is applied and just the final results are provided through surveys or statistical analysis, but little is known of what actually transpired during those sessions.

In the end, I hope that the process shown in this study and the proposed framework will be an initial step that will be useful for professional developers and educators in order to answer the questions that Deborah Ball (1995) posed: What works in professional development? What happens during the session(s) that promotes or hinders learning? How we can analyze these phenomena? This thesis is an attempt to provide a process that can enable other researchers to analyze the professional development activity as a lived experience in a way that could provide valuable insight to the people doing this kind of work.

Outline of the Thesis: Organization

In the next chapter, I provide a literature review of the different aspects that affect professional development: engagement, motives, adult learning, and what it is that teachers and the professional developer bring to the sessions. There is a history previous to the encounter between the participants that will have an effect on the effectiveness of the sessions. That history comes as a result of many components that have an effect on teachers' learning. In-service teachers are adults, and their motives and ways of learning are not the same as those of children or pre-service teachers. They have different expectations about what they hope to learn and why, which have been impacted by their teaching experience.

In Chapter 3 I present a framework that I developed based on a modified version of Remillard's (2012) model, which she uses to analyze various ways curriculum developers try to make their manuals and textbook materials attractive to teachers. I provide a framework which can be represented with a visual devise, which offers a better sense of the complexity and the unfolding of these conversations, such as what are the

participants' wants and motives, and how fluid is their interaction. In addition, the model provides information about other elements, such as mood and inner group interactions that directly influence engagement and learning outcomes.

In Chapter 4 I present the methodology and the steps taken towards the implementation of a new mathematics program at the school where the professional development sessions took place. It is important to mention that teacher participation in the professional development sessions was mandatory, but participation in this study was voluntary. Furthermore, there were constraints about the setting of the study imposed by the school administration, which had an influence on the outcome of the sessions, and things did not always go as well as I expected. I describe the implementation challenges and focus on one in particular, why I chose another methodology for the session instead of the one that I originally suggested. This is important because, as I just mentioned above, it is not always possible to work under optimal conditions. Often one has to work with what is possible. Also, I describe the challenges that I faced as I tried to develop a visual way to represent the professional development experience in a way that was useful and succinct. I describe a model that was used in the beginning, Sfard and Kieran's (2001) flow charts, which were developed to analyze micro moments of learning experiences of students in the classroom. I applied a modified version of this visual device but at a macro level, to describe a sense of the flow of a session during crucial moments of learning and engagement, and also to realize final outcomes at various points of the session. I used these visual charts to represent the data in a multidimensional way in order to provide a more holistic sense of interactions among participants. But in the end these charts did not provide information in a useful way, because the resulting narrative was cumbersome and difficult to analyze concisely. However these charts provided a first step towards what I consider a more useful model.

Chapter 5 provides a descriptive and visual representation of data. Here I provide a visual description of the framework, which can be used to describe a variety of scenarios that can occur during a professional development session. These scenarios represent instances of interactions among the participants and what was accomplished during those interactions. The visual representation of this framework provides a way of looking at the components of each scenario, that allows an analysis of the lived experience of professional development. In the second part of this chapter I provide an example of a

professional development activity equivalent to a lesson in a students' classroom. The analysis shows this activity as being composed of several scenarios, where each scenario occurs as I need to redirect the group in order to try to achieve the goals of the activity.

Chapter 6 is another cut of the data. My analysis showed me the significance of each one of the framework components, which provided me with relevant insights into what can promote or hinder learning, as well as themes about teachers' behaviours and practice. . This framework provided me with a way to find out if the participants —the teachers and the professional developer (myself) — were able to obtain from the interaction what they wanted, and how. Concluding remarks and future possibilities for research are presented in Chapter 7.

My goal is to look into the professional development experience: the level of activity through a learning task and different types of engagement that may have occurred. I want to be able to learn from the interactions between me, as a facilitator, and the teachers; the moments of reflection and doubt; and the exciting moments when some new understanding and learning has been achieved. The ultimate goal of any professional developer, including myself, is to be effective in facilitating learning and providing learning opportunities. However, my goal for this research is to provide a tool for learning: by providing a way to analyze a professional development session, as it happens, not through a survey or post performance results. It is my hope to provide a tool for others and for myself to use to improve our profession.

Chapter 2. Literature Review

This chapter will take a look at different factors that influence professional development sessions. I start by giving a definition of what professional development is, as well as what is generally expected from professional development. Afterwards, I provide an overview of the elements that play a significant role in professional development activities: motivation, adult learning, group dynamics, what the teachers and the facilitator bring to the session, and resources.

What is Professional Development?

In general, professional development is viewed as an instrument of instruction usually provided at the workplace, wherein the goal is to improve job performance. In the case of professional development in schools, the aim is to improve teachers' practice. Loucks-Horsely, Hewson, Love, and Stiles (1998) define it as “the opportunities offered to educators to develop new knowledge, skills, approaches, and dispositions to improve their effectiveness in their classrooms and organizations” (p. XIV).

The role of the professional developer can take two main forms: facilitator or trainer.

- The facilitator acts as a coach or guide for teachers throughout the learning experience. Teachers are the ones who are expected and encouraged to use this learning opportunity to construct their new knowledge. This form of professional development parallels the role that teachers are supposed to assume with students in many of the new pedagogical approaches, where teachers structure the lessons with tasks that are meaningful and challenge students’ in such a way that opportunities can arise for students to develop and construct their own knowledge (Lambert, 2003). In the case of teachers, the facilitator structures tasks and activities that challenge their beliefs and helps them to construct meaning through activities, dialogue and reflection. Teachers’ input is an essential part of this process and very much valued.

- The trainers are there just to transmit information and in this case, teachers usually respond as passive recipients. Teachers' input is not an important part of this process of learning. In the past, both professional development and teaching was done in this manner. Nowadays, it is still not uncommon to find teachers who take a passive stand while 'collecting information' for their practice during professional development opportunities.

An effective professional development program must be ongoing, focused on mathematical content, and have as a main goal the development of communities of learners, where 'learners' refer to two groups: a community of teachers and a community of students and teachers (Desimone, Smith & Ueno, 2006; Loucks-Horsley, et. al., 2003; Guskey, 2003).

Professional development should be viewed as a lifelong process and the school administration should provide teachers with access and time for sustained long-term growth: "a necessary condition for change is that individuals alter their normative orientations and develop new ones" (Richardson & Placier, 2001, p. 917). This can only happen through deep reflection, which takes time. Unfortunately, in most cases, professional development of teachers is sparse and infrequent and time is not provided for teachers to think about what was delivered during the professional development sessions.

Professional development is seen as something usually done to teachers rather than for teachers. However, current research, like the one conducted by Papastamatis (2009), provides a series of suggestions that seem to help make this learning opportunity more proactive and meaningful for the teachers. It is usually recommended that teachers take on the responsibility of their own professional development, and for the professional developer to stand as a facilitator supporting their learning in an atmosphere of mutual respect, where teachers feel encouraged to experiment with new ideas. The professional developer needs to provide learning opportunities where teachers learn to develop metacognitive abilities that guide decisions and help them to reflect on their practice (Hammerness et al., 2005). Professional developers should also provide the opportunity for teachers to work with programs that address different ways of teaching and learning.

Teachers must learn how to make decisions about teaching depending on particular groups of students.

According to Bandura's social cognitive social theory (1986) there are three factors that affect learning: self, environment and behaviours. All of these factors influence teachers' wants and motives in a collusive way, which in turn affect engagement and consequently what teachers learn during professional development sessions. For the professional developer, the sessions are also learning opportunities about teachers' wants and motives and how to use those wants and motives to better engage and support teachers' learning.

Professional development programs should take care to address the needs and expectations of teachers given that their wants and motives play a key role in the teachers' engagement during professional development sessions.

Motives, Wants and Engagement

Teachers' participation in professional development, how they engaged in this activity, is influenced by the teachers' motives and wants (Liljedahl, 2014). This section examines these three features that play a significant role in professional development.

In the Glossary of Education Reform (Concepts, 2014), **student engagement** refers to the degree of attention, curiosity, interest, optimism and passion that students show when they are learning or being taught, which extends to the level of motivation they have to learn and how they want to progress in their education. Interestingly enough, I could not find a similar definition for **teacher engagement** as it referred to their learning in a professional development setting. I would not directly apply the above definition to teacher engagement, but level of activity, curiosity and motivation would be factors directly related to their engagement during an opportunity for learning. Engagement seems to have various meanings depending on the people and the circumstances it is applied to (Carini, Kuh & Klein, 2006; Coates, 2009; Anderson, Carmichael, Harper, & Huang, 2009). In this study, I define engagement as the different ways in which individuals and groups

come into action, or become involved with an activity, where these different ways of acting/behaving are influenced by different levels of motivation, motives, wants and goals.

Motivation is a key factor for learning that is self-regulated and also regulates the level of activity, types of engagement, the interactions between the professional developer and teachers, reflection, doubt, and the exciting moment when some new understanding and learning has been achieved. To provide a setting where teachers become motivated to become involved or engaged, is a crucial step to learning as: “Participants create meaning as they engage themselves in challenging learning activities. In engagement, the learners are active and might be searching, evaluating, constructing, creating, or organizing some kind of learning material into new or better ideas, memories, skills, values, feelings, solutions, decisions” (Wlodkowski, 1999, p. 44).

What is the difference between motivation and motive? According to the research I will be drawing on, motivation is a theoretical construct that can be used to explain behaviour (Elliot & Covington, 2001; Pardee, 1990), whereas motive is something that moves a person to do something (Ryan & Deci, 2000). According to Ryan and Deci’s Motivation Theory (2000), there are different levels and different types of motivation that are closely related to attitudes, goals and/or wants that prompt an individual to particular actions.

Depending on the source of attitudes, goals or wants we are able to distinguish between intrinsic and extrinsic motivation. Ryan and Deci (2000) define intrinsic motivation “as the doing of an activity for its inherent satisfaction rather than for some separable consequence” (p. 55), and some researchers view intrinsic motivation in terms of the level of satisfaction a particular task provides, while others look at how interesting a particular task is to an individual (Skinner, 1953; Hull, 1943). For the professional developer, it is of particular interest to find out what makes an activity intrinsically interesting to an individual, given that it is generally recognized that intrinsic motivations usually transfer into a “high quality of learning and creativity” (Ryan & Deci, 2000, p. 55).

Extrinsic motivation happens whenever an activity is done for its instrumental value; however, the level of autonomy in choosing to act can vary. For example, a teacher can take an upgrading course because she thinks that it would be valuable for her career,

and another teacher is forced to take a series of professional development sessions by her school administration. In both cases they are doing an activity for instrumental reasons and the motivation is extrinsic. The difference is that the first one is doing it by choice and the second one is forced into compliance by an external factor.

Ryan's and Deci's (2000) seminal work on self-determination and motivational theory provides a taxonomy of human motivation, which classifies levels and types of motivation according to how much an action or non-action emerges from the individual self. They provide three main classifications: amotivation, extrinsic motivation, and intrinsic motivation.

They define amotivation as "the state of lacking an intention to act" (p. 61). In this case, the activity is irrelevant and of no instrumental value to the individual, or the individual has misgivings about unclear outcomes and would rather do nothing. It could also be that the individual feels a certain level of incompetence regarding the activity and prefers not to act.

Within extrinsic motivation, a sub-classification is provided according to the level of external versus internal regulation:

- External regulation: the push to action is forced on the individual by completely external causes.
- Introjection: the individual acts either to avoid guilt or anxiety or to attain approval from others.
- Identification: the individual consciously values the activity and accepts its regimentation as her own.
- Integration: individual harmonizes and fully assimilates new regulations to the self. It is still extrinsic because motives are still instrumental.

Ryan and Deci (2000) define intrinsic motivation as a completely self-determined activity. The individual is self-motivated to act. However, levels of motivation can change as the individual internalizes regulations and values. Lambert and McCombs' (1998) research about motivation identifies curiosity, the desire to make meaning from a learning experience, and the desire to become effective by the use of knowledge learned, as

fundamental sources of motivation that are essential to being human and can all be sources of intrinsic motivation (Deci, Koestner & Ryan, 2001; Csikszentmihalyi & Csikszentmihalyi, 1988; Wlodkowski, 1999). The goal of a professional developer is to help teachers develop an intrinsic motivation towards a continuous learning of mathematics and their teaching practice and as such, s/he should provide learning opportunities where these elements are part of the process.

Motives and wants are concepts that point to elements within and outside of an individual, and they seem closely connected. A motive corresponds to a want or a preference that is sufficiently strong that it moves us to action or deliberate inaction (Braybrooke, 1992). In this study, I refer to a want as something we would like to be given or we would like to obtain and to a motive as something that would drive us to actions, with this action cast back though engagement, which is usually an indicator of learning. An example to see the difference between these two terms could be: A teacher is motivated to attend a professional development session because s/he heard that the facilitator is very good (here the teacher springs into action). A want could be something she would like to obtain while she is at the session, such as an exemplary lesson plan (here the teachers does not engage necessarily into any action).

There are many factors in addition to motives and wants that have a direct impact on the kind of engagement happening during a professional development session. In the following pages some of these factors will be explored further. Teachers' predispositions towards professional development, for example, make a great difference during the professional development sessions. Teachers are not like young students; they are adults with teaching experience and certain kinds of expectations regarding the learning opportunities to which they are exposed. Teachers' motives, attitudes and expectations will have a great influence on their agency and engagement during the professional development.

The Teacher Factor

Teachers are adults and have a background on teaching and learning practices that have to be taken into account by the professional developer as a factor in preparing a

professional development session. This section explores the difference in attitudes that an adult, particularly a teacher, may bring to learning opportunities, as compared with those of young students.

Developing a teacher involves developing the person (Bell & Gilbert, 1996). In most cases, adults present different characteristics and demands regarding their learning. Teachers' beliefs about teaching can influence their willingness to engage in a particular learning opportunity, and different teachers will respond differently to different approaches. Since we are dealing with different individuals with different beliefs, wants and practices, it has been suggested that using a combination of different approaches might be the best way to develop professional development sessions (Richardson & Placier, 2001).

In general, teachers are able to control their learning and a key factor that influences their level of agency is self-regulation. Self-regulation in learning is guided by academic skills (content knowledge and metacognitive knowledge), and the will to learn (Muis, 2008), but we also need to take into account personal needs or wants, which provide the motives to engage in learning opportunities. Research has shown that most teachers are present-oriented in that they need to know how what they are learning would be useful in their current practice, and they will learn what they think they need to learn, rather than what somebody else tells them they need to learn (Merriam, 2001; Merriam & Caffarella, 1999; Pellicer & Anderson, 1995). However, teachers often take a chance and engage in learning experiences where changes in their practice are expected, but in order for them to engage in a new experience, they need to know why they are engaged in change and what the benefits could be (Darling-Hammond, 1995; Darling-Hammond & Rothman, 2011).

Self-efficacy is another component of self-regulated learning. A person is more motivated to learn a subject in which he or she feels confident. Here, teachers' metacognitive skills play an essential part in self-regulation because they allow them to understand their own thinking process by being able to analyze practices that will best generate learning (Crain, 2005). Confidence is also a critical determinant of positive learning outcomes. It encourages individuals to take risks, which can lead to further

learning; moreover, their level of confidence is a factor that can determine the level and kind of engagement that an individual will present during professional development opportunities (Milburn Moore, 1952; Toynton, 2005).

Teachers' learning can take place in many ways: individuals working on their own; planned professional development opportunities at school; or, taking extra professional courses for credit. However, being able to facilitate teachers' learning involves understanding how adults learn and how they will put their learning into use in the classroom. Andragogy (adult learning) is a theory that originated in Europe in the 1950's that emphasizes equality between the teacher and the adult learner. Knowles (1980, p. 43) has defined it as "the art and science of helping adults learn", highlighting how adults and children do not necessarily approach learning in the same way. Knowles provides a list of the differences between andragogy and pedagogy, the latter being "the art and science of teaching children" (pp. 43-44).

Table 1: Knowles' andragogy and pedagogy comparison

	Pedagogy	Andragogy
A learner is:	Dependent in his learning and society prescribes the learning process	Through maturation the individual moves from dependency to increasing self-directness
Role of the learner experience:	It is usually assumed that students do not bring much experience into most learning situations	Adults have accumulated a rich source of experiences that will influence the acquisition of new knowledge
Readiness to learn	Children are open to learning what everyone else is learning	Adults are more willing to learn something when they have the need to learn it
Orientation to learning	Learners see what they learn as something that will be useful later in time. Students are "subject-centered in their orientation to learning" (p.44)	Adults see learning as something that will increase their potential and competence in a way that will be reflected in their lives now or the near future

From these differences Knowles indicates that adults are internally motivated and self-directed, and that they will resist what they perceive as an imposition (Fidishun, 2000). Adults bring life experiences and knowledge to learning experiences and acknowledgment of these facts during the process facilitates engagement and rapport among the

participants. As Knowles writes, “To children, experience is something that happens to them; it is an external event that affects them, not an integral part of them” (p. 50), but adults define and value themselves by their individual array of life experiences and knowledge, and as such there is a good chance that they will reject a learning opportunity where their own experiences are minimized or ignored.

Adults will seek a learning experience if it is relevant to them and will help them deal in a more satisfactory manner with real-life undertakings or problems. They also would like to be able to envision how their learning will transfer to their practice. As one can see from the previous table, relevance, effectiveness, and practicality are key elements that can provide the basis for the wants behind the motives for accepting or rejecting a learning opportunity. In this thesis, motivation is viewed as “an internal state that arouses, directs, and maintains behaviour” (Woolfolk & Margetts, 1998, p. 351). These authors go on to describe the study of motivation as being focused on “how and why people initiate actions directed toward specific goals, how intensively they are involved in the activity, and how persistent they are in their attempts to reach these goals, and what they are thinking and feeling along the way" (p. 351).

Teachers’ initial actions are to put their attention to finding out how much of their beliefs, needs, ideas and values are included in what is being discussed during the professional development sessions, and if any new ideas being presented make any sense or add any value to what they already know or with which they are working. Personal relevance is a key motivator that can help provide a positive attitude towards the learning goals at the professional development sessions. If we are interested then we follow the experience in ways that are most meaningful and valuable to us; “participants create meaning as they engage themselves in challenging learning activities. In engagement, the learners are active and might be searching, evaluating, constructing, creating, or organizing some kind of learning material into new or better ideas, memories, skills, values, feelings, solutions, [or] decisions… Engagement is the process, and challenge is the opportunity” (Wlodkowski, 2003; pp. 7-8).

It is also important to realize that change does not happen in an instant and that changing one’s practice can only happen through deep reflection. Change takes time

because constructions of knowledge need to be challenged, renegotiated, and reconstructed (Bell & Gilbert, 1996; Richardson & Placier, 2001). Professional development opportunities must provide the time, space and options for teachers to investigate, engage and reflect on new practices.

As stated above, self-regulation focuses on the need for a person to recognize her own ability to learn. However, this recognition is heavily dependent upon the individual factors already mentioned, but also on perceptions that an individual may have that come from the world around her. The environment that is provided for a learner to learn in plays a key role in the effectiveness of the learning experience.

Environment

Bandura (1986) claims that perceptions play a key role in influencing motivation, and there is considerable research that provides substantial evidence that proves his assertion (Watt & Richardson, 2007; Groth & Bergner, 2007; Arthur, et al., 2006; Somers & Piliawsky, 2004, 2009).

Neuroscience research has been corroborating how powerful our emotions are in influencing our motivations (Ratey, 2001), and at the same time how deeply our emotions are influenced by our society and culture through language, values, belief, and every aspect of our social lives. Professional development is a domain where emotional reactions can either boost or worsen the learning experience that the professional developer hopes to provide; embarrassment, for example, is an emotion that usually dampers any motivation to learn and a professional developer must be careful to avoid any possible situation where a teacher could be embarrassed.

We want teachers to be active participants during the learning opportunities provided by professional development. Wlodkowski (2003) refers to participation, learning and transfer as the logical procedural triangle that has supported human cultural development. Active engagement is key to learning, and “unless adults participate, they cannot learn, and without learning there is no possibility for transfer” (Wlodkowski, 2003, p. 3). An atmosphere of inclusion would also facilitate teachers’ participation, and

according to Wlodkowski (2003), professional developers can generate an atmosphere of inclusion through collaborative learning, where all the participants are encouraged and supported regardless of their different learning and teaching styles and also by providing opportunities where there is multidimensional sharing from all the participants.

Sometimes teachers know that they need to change their practice but are not ready to take the leap. Prochaska (1999) calls this the contemplation stage of change, and Wlodkowski (2003) re-states again the importance of an atmosphere of inclusion, which in this case will help teachers who are not ready to change to bring them out from this stage into the learning process. Through inclusion, social needs can be met and individuals are then more willing to take risks, make mistakes, and share resources. All this provides greater opportunities for change and learning.

Adults are usually more intrigued and therefore more willing to participate in a learning task when they perceive that the process will allow them to engage in substantive actions, either individually or together, which require complex thinking to construct new skills or deeper meaning (Dalnes, J., Dalnes, C., & Graham, B. 2006; Jarvis 2010). The key backbone of change is that something different must happen; a new conception must be clearly realized, embraced and owned (Ball, 1995). For this reason it is also important to start a program by providing a clear explanation of the goals and the process, as well as getting to know the participants in a way that allows a facilitator to support their learning (Wlodkowski, 2003; Caffarella, 2002; Wlodkowski, 1999). Clear guidelines and goals entice teachers' participation by providing a sense of safety and purpose.

Wlodkowski (2003, p.5) provides a list of guidelines for professional developers in order to help them generate an environment of inclusion:

- The participants' personal information that was shared during the session should be kept private.
- Sometimes it is helpful for the participants to hear about personal experiences from instructors regarding challenges.
- Do not blame and avoid making generalizations about people.
- Give participants time to share their experiences and their knowledge.

- Spend some time also focusing on your own learning.

The professional development session should always end with an action plan. This plan should be supported by teachers and the school administration. Supportive colleagues and administrators (Breaux, 2003; Elmore & Burney, 1999) are key to professional growth. How a teacher is supported by a group of colleagues, as well as the school administration will greatly influence her engagement in a variety of learning activities.

The Influence of Group Dynamics

So far I have looked at factors in the learning environment that affect the individual, but the context in which the individual works in is also a key element that influences learning and change. Researchers emphasize the importance of relying on each other to grow and develop and on the background or the social contexts in which this learning takes place. Learning is a social activity (Nuthall, 2015), and the reflective process of learning is also affected by the social context (Jarvis, 1992; Merriam & Caffarella, 1999).

Hargreaves (1992) pointed out that the interaction among teachers depends on the cultural context that they share: “the substantive attitudes, values, beliefs, habits, assumptions and ways of doing things” (p. 219). He investigated the importance of teachers’ cultures and the impact that the cultural environment can have in changing their practice. He identified four different forms of teacher interactions or teacher cultures in schools: individualism, balkanization, collaborative culture, and contrived collegiality, and stated that the most collaborative forms of interaction among teachers are more advantageous in inducing sustainable educational change.

The individualistic culture is common in schools in the US and Canada, where teachers work in isolation, and where most interactions among teachers occur in staffrooms where usually their conversations are not centered around their practice. Staffrooms are mainly places of relaxation and socialization where views about teaching and education are not usually discussed (ibid). Hargreaves (1992, p. 220) agrees with Lortie (1975), who identifies three approaches teachers may develop in a culture of

individualism: *presentism,* where teachers only focus on their own classroom and present practice; *conservatism,* where teachers choose not to discuss issues that would lead to changes in their practice; and *individualism*, where teachers avoid collaborating with colleagues and may fear the criticism that may arise from such collaboration.

Hargreaves describes the balkanized teacher culture as a culture of competition among teachers either within groups or individually with the goal of obtaining positions or some kind of supremacy over others.

In the collaborative culture, teachers actively interact with other teachers on a daily basis. They talk about their practice and share their experiences, including possible mistakes, since in this type of school culture mistakes are seen as opportunities for learning. Teachers are not afraid of criticism and, according to Hargreaves (1992), this kind of school culture can contribute to counteracting teachers' inhibitions, which in turn would help them improve their practice. In order to develop this kind of culture at a school, time needs to be provided for teachers to interact and to establish relationships in which it feels safe for them to provide and receive constructive criticism from their colleagues; it is important to have enough time to interact in a manner conducive to improve teacher's practice. In schools in North America, when teachers have time, it is usually spent dealing with students' behavioural problems and administrative requirements. Also, when they are introduced to new programs, teacher collaboration will focus "on the immediate and the practical to the exclusion of longer-term planning concerns" (ibid, p. 229). He calls this "bounded" collaboration, which is usually oriented towards presentism and conservatism as it does not allow for a sustainable, collaborative, in-school teacher culture.

Contrived-collegiality is the fourth characteristic of school-teacher culture identified by Hargreaves (1992). He describes contrived collegiality as "a set of formal, specific bureaucratic procedures to increase the attention given to joint teacher planning and consultation" (p. 229). Here, collaboration is externally organized either by the administration or by pre-established procedures. Hargreaves sees this as a possible preliminary way of getting teachers to start working together, but he cautions that "collaborative cultures do not mandate collegiality and partnership: they foster and facilitate it" (p. 230).

The patterns created by the different forms of teacher cultures may contribute to or hinder a variety of relationships and collaborations among teachers and ultimately support or hinder their practice. How teachers work or interact with their colleagues will definitely influence the level of engagement that will occur during professional development sessions. For example, it could determine how or if a teacher will take advantage of a learning opportunity. A teacher may want to participate in the activities provided during the professional development sessions but may not feel comfortable trying something new or different in front of their peers. Peer interaction can definitely have an influence on the outcome. As stated at the beginning of this section, researchers emphasize the importance of relying on each other to grow and develop, and therefore what each one of us brings to learning opportunities will have an impact in what is learned.

What the teachers and professional developer bring to learning opportunities

The main action plan of a professional developer is to set goals and strategies to facilitate learning and to increase the level of competence in teachers' practice. Competence is usually related to effectiveness, which provides the measure of how well we are able to apply what we have learned (Wlodkowski, 2003). Teachers' wants and motives have already been mentioned, but supporting an improvement in the levels of competence in a teacher's practice is what professional developers aim for and what motivates them.

Shulman (1986, 2004) emphasizes the importance of developing deep content knowledge in teachers, and its importance for effective teaching. He distinguished three main domains of teacher knowledge:

- *Subject matter knowledge* includes the specific content of the subject as well as the understanding of the bona fide structures pertaining to this subject, like concepts, principles, facts, connections among concepts, structure, how validity or falsehood is determined, etc.
- *Pedagogical content knowledge* concerns itself with ways of teaching particular content on a subject to students and it also includes knowing what makes some ideas difficult or easier to learn, as well as possible misconceptions learners may have.

- *Curriculum knowledge* refers to knowing and understanding curriculum options available to students.

It is assumed the professional developers are experts on these three domains. This is the knowledge that is needed to facilitate opportunities that will support learning that will address issues teachers may have with any of these areas of knowledge for a particular subject or concept, as well as to help them interconnect this newly acquired knowledge within these three domains.

There are also three main components that teachers bring to the professional development session that influence their expectations (wants) and the level of success of this endeavour: their knowledge, how they reflect on their practice, and how they develop competence. In my experience, as a professional developer, these three components also have to be present in my intrinsic way of learning in order to improve my practice. Not only that, but through reflectivity these three components also became tools of my trade. I believe that the professional developer's expertise in the three domains, and her capacity to utilize her reflections and observations, will have an impact on their capacity to recognize opportunities for learning, and to know which subsequent responses and actions to take, in order to engender the necessary engagement for learning. The professional developer's job is to position teachers in situations or settings that move them to learn.

Schön's reflective practitioner model (1987, 1983), as well as further research attribute to reflection a key role in the development of effective teaching (Kagan, 1992; Borko Mayfield, Marion, Flexer, & Cumbo, 1997). Reflection is often seen as a necessary step to alter a teacher's practice. When a teacher is able to 'think about the thinking' through reflective practice, he/she is able to enhance his/her expertise thought a metacognitive process (Scardamalia & Bereiter, 1991). The same is true for professional developers. What we can conclude is that it is expected that the professional developer has to have a deeper understanding of the three domains of knowledge mentioned above and as well as a level of reflection about her practice that will support and facilitate learning opportunities for others.

Resources

Besides the professional developer, there are other means that could bring about a transformation in teachers' practice. I am referring to the variety of artefacts that many people refer to as resources. Artefacts come in many forms and shapes, and even a professional developer is a resource, but most times teachers are only provided with artefacts like textbooks, teacher's guides and videos, and in many cases these are the only resources that are provided to elicit a change in their practice.

Teachers and professional developers use a wide variety of resources/artefacts in their practice. They engage, use and re-source these resources in many ways. It is normal to find that during professional development activities teachers would interact with a wide range of resources. In this study I use mostly the term 'resource' instead of 'artefact' in order to broaden the perspective on the elements available for the teachers to work with: teachers collect resources, select, transform, share, implement, and revise them and 're-source' them (Adler, 2000).

In general, curriculum developers work hard to put together "teacher proof" manuals, textbooks and resources that eliminate or minimize the need for teachers to modify their use in any other manner than how the developers had envisioned. Research has shown that new curriculum implementation is usually not straightforward, and that it depends on how teachers use the teacher's guide and other resources, and also on how they interpret the 'new curriculum' (Remillard, 2005; Gueudet & Trouche, 2009, 2012).

Remillard's (2000) research has shown that not all teachers utilize resources in the same way. Some of them follow instructions exactly as suggested by the curriculum developers, while others will just look at the content and will follow the suggested sequence but without making the required and expected changes in their practice, and others will take portions of resources as it fits their needs. Rosenblatt (1982) explains that while reading a text, the reader's relationship is with the text, not with the author of the text, so when a teacher interacts with the program's resources, s/he is interacting with the artefact rather than with the developer. Consequently, research keeps showing that many teachers use program resources (textbooks, workbooks and manipulatives) in ways never planned by their developers, and it does not matter how well written the teacher's guides

are (Remillard & Bryans, 2004), because, as the teachers interact with a text, they will consciously or unconsciously take a stance which will affect the way they will use it (Rosenbaltt, 1980, p. 388).

Furthermore, Remillard (2012) points out that reading a curriculum and teacher's guides is different than reading other texts because of elements of predictability or expectations that will emphasize particular responses in teachers. Different teachers will look for different kinds of guidance and this very much depends on the stance they have towards the program and the role the resources play in their teaching. Also, we should keep in mind that teachers initially interact with resources the way they have interacted with the ones they had previously used (Remillard & Bryans, 2004; Sherin & Drake, 2009), so the way teachers will engage with these materials is very much a response to past experiences. This can make the job of a professional developer difficult because in some instances the way some resources have been used is not consistent with the intentions of developers of the resource. Consequently there can be some resistance to change.

The use of multimedia (Pryor & Bitter, 2008) is becoming an important tool for working with both novice and veteran teachers. Videos can support teachers' learning in a variety of ways. In some cases, videos can be used to demonstrate new ways in which teachers can explore specific content areas with students (e.g., Hatfield & Bitter, 1994), and in other cases, to illustrate particular classroom processes like problem-solving (e.g., Corwin, Price & Storeygard, 1996). In both cases, there is an emphasis on helping teachers to learn more about their practice.

Shulman (1992) underlines the relevance of using cases and how, by being able to provide a wealth and variety of cases through videos, teachers can reflect and analyze teaching and learning processes through noticing and interpreting. Sherin and Van Es' (2005, 2008) research points out that expert teachers make conscious choices about where to direct their attention. Videos are a good tool to support the development of teachers' ability to notice classroom interactions (Sherin & Van Es', 2009, 2008, 2006, 2005, 2003, 2002). Viewing videos provides teachers with an experience that removes them from the demands of the classroom, and puts them in a situation where they do not

need to act but can learn more about noticing what is happening and reflect on action taken by teachers and students in the classroom.

Production and use of video documents can be useful in teachers' learning. However, one must be careful to not lead teachers to reproduce what they see on the screen by mere imitation, as I will show in some examples that I will present in my analysis.

Final Remarks

There are many factors that affect the unfolding of professional development activities. As evident in the literature there is much to take into account in order to provide a clear picture of what contributes to success in professional development situations. Human heterogeneity presents a challenge to this kind of study, but it is a worthwhile venture. Much can be gained from having a better understanding of this kind of practice.

In particular, being aware that teachers as adults are different than young students or pre-service teachers should encourage careful observation of what actually occurs when they are in professional development learning situations. There is substantial data and research on what occurs in the classroom with students and pre-service teachers as they learn, but less has been done to investigate what happens with in-service teachers. As mentioned in this chapter, in-service teachers bring a whole different set of skills and expectations, and it is relevant to know what role those skills and expectations play in their learning.

Chapter 3. Framework

Introduction

In *Educating the Reflective Practitioner*, Donald Schön (1987) analyzes ways in which people learn, and provides examples of learning experiences in a variety of professional fields, where he puts forward evidence that professionals who are able to receive a type of coaching that encourages them to carefully think and reflect about what they are doing will learn in a deeper and more thoughtful way. Moreover, he is adamant in stating that as facilitators or coaches for learning, professional developers can only provide opportunities, but that the final responsibility of learning ultimately falls on the learner.

So how are we professional developers to help teachers? Schön suggests facilitating and providing opportunities where teachers go through a process of putting things together, and use what they know in order to deal with the variables and constraints of the challenge at hand. He states that this way of leading learning can potentially ease the way for them to discover something new. As a coach/facilitator, the professional developer can only provide a repertoire of options, and respond to the teachers' actions by listening, reflecting, engaging in dialogue, re-framing and trying again. Professional developers should only expose their own thinking to help and guide the learner.

Schön also points out that the learner, in this case the teachers, must be willing to have the experiences necessary to discover and learn new things. It follows then that the professional developer's main artistry lies not just in her knowledge of the field of study, but also her ability to engage others in the learning process.

According to Woolfolk's (1998) motivational theory, people's motives and wants are behind the level of engagement, which is geared towards specific intentions or objectives. His motivation theory focuses "on how and why people initiate actions directed towards specific goals, how intensively they are involved in the activity and how persistent they are in their attempts to reach these goals" (p. 399). Because motivation and motives are deeply guided by teachers' wants, these key elements will hinder or encourage teachers' engagement and learning during the professional development session, and the

facilitators must tend not only to their own motivation, motives or wants but also those of the teachers, while planning and delivering the professional development sessions.

Teachers' motives, wants and learning, which are exposed through different modes of engagement, are the focus of the theoretical framework of this research. Research has shown that the motives and wants that teachers bring into a professional development environment affect teachers' levels of engagement during the session (Liljedahl, 2014). Consequently, engagement is an indicator of wants and motives and vice versa.

In this research, I analyze teachers' engagement through the way in which they communicate during professional development sessions. Through different types or modes of engagement, one can witness moments of reflection, moments of enlightenment and exploration, rejection, resistance, confusion, fear or doubt, and hopefully become aware of teachers' motives, wants and ultimately, their learning. I will be on the lookout for individual and communal *points of inflection*, which I define as an instance where there is a meaningful change in the fluidity of the session towards optimal flow. Csikszentmihalyi's Flow Theory (1990) claims that optimal learning experiences are intrinsically motivated, linked to positive emotions, which will heighten the cognitive process. It is here where learning possibilities for an individual or the whole group participating in the session may arise. Emotional aspects of engagement emerged in Shernoff, Csikszentmihalyi, Schneider and Shernoff's (2003) research, who pay special attention to enjoyment, apathy and level of interest.

In this study, I analyze the interplay between communication and types of engagement among professional development participants, and how as the professional developer in this study, I was at times able to negotiate and navigate between my motives for the sessions and the goals I hoped to achieve and the teachers' motives for participating and their goals. I want to look into the professional development experience: the level of activity and different types of engagement, the interactions between facilitator and teachers, the moments of reflection and doubt, and the exciting moments when some new understanding and learning has been achieved. The ultimate goal of a professional developer is to be effective in facilitating learning and providing learning opportunities; the

premise of this study is that by being able to analyze different types of engagement though communication, one would be able to have a better idea as to what occurs during these sessions, what does and does not work and why, as well as be able to pin-point occasions of learning. I am looking at the phenomenon of the lived experience of professional development of teachers in the context of implementation of a new curriculum at the school level; for this reason a phenomenological methodology was chosen as the basis of this research.

Phenomenological Research

I believe that the best way to analyze communication and engagement is in the happening, as we experience it in the 'lived world,' and consequently, my framework will be based on a phenomenological approach. According to Campbell (2001), "describing the origins of mathematical understanding in the phenomena of lived experience" (p. 9) was one of the primary concerns that Husserl tried to address in his study of the *Philosophy and Phenomenology of Mathematics*, in which he wrestled with reconciling the notion of mathematical objectivity and the intrinsic subjectivity of lived experience.

Campbell (2001) examines possible phenomenological approaches to teaching and learning mathematics, and is cognizant that mathematics emerges within a cultural and historical context. He points out that very seldom in a classroom, while teaching, do we ground mathematical ideas within the historical and cultural background in which they developed. He warns, however, against just performing historical and cultural recapitulations. If we are to do this, we should identify where the "necessary conditions for grounding the logical structure of mathematics in lived experience occurred" (ibid, p. 11) and then proceed to describe them. However, it is not always necessary to go back to past history to analyze mathematical lived experiences; Campbell (2001) points out that we can also look into how elementary mathematical concepts such as addition, multiplication or the idea of a unit appear and develop these ideas from lived experiences in the classroom and in everyday life. He emphasizes that phenomenology can be a way in which the logical and the psychological aspects of mathematical understanding and learning can be observed and analyzed. .

We can track the origins of phenomenology possibly to Kant and/or Hegel, but phenomenology as we know it today was put forward by Husserl in the early 20th century. Husserl was a student of Franz Brentano (1838-1917), who stated that consciousness was naturally intentional. Husserl, in turn, argued that individuals can only be sure about things as they appear to their consciousness, and that therefore 'reality' must be treated only as phenomena. Heidegger, a student of Husserl, introduced the term *Dasein,* which means "existence" in German, and which for Heidegger implied a way of being involved with the world. His goal was to discover the primordial nature of 'being'. For Heidegger, *Dasein* is an entity that exists and its character needs to be understood as being grounded in a state of 'being in the world' (Heidegger, 1962). Both Husserl and Heidegger examined the 'lived world' in which experience takes place. However it was not until the 1970s that the phenomenological praxis of research was established by phenomenological psychologists like Giorgi and Adrian Van Kaam (Stones, 1988).

The main aim of the phenomenological research is to describe as accurately as possible a phenomenon itself, and its main concern is the 'lived experiences' of people involved in the phenomenon (Greene, 1997). Phenomenology has been conceived as a philosophy, as a research method, and as Maykut and Morehouse (1994) also point out, as a frame of reference for qualitative research.

Merleau-Ponty (2012/1962) identified four characteristics that could help differentiate between different types of phenomenology: reduction, description, intentionality and essence. Description refers to the fact that phenomenology relies on the description of the phenomena as they present themselves in the individual's consciousness, while reduction refers to the process of suspending or bracketing the phenomena. Husserl states that, through bracketing, we could obtain a more objective sense of the phenomena, and he prescribed the use of reductions in order to better understand the workings of consciousness and in order to not reduce phenomena to just descriptions, but to understand how different aspects compound the actual object as experienced by the person experiencing it (van Manen, 1982). Essence refers to the foundational meaning of an individual's experience and makes it what it is. Intentionality is usually described as "aboutness", and refers to the total meaning of the object or ideas,

which is constituted for consciousness in a variety of ways: perception, memory and significance.

Hein and Austin (2001) point out that there is no single way to do phenomenological research, given that “the specific method used depends […] on the purposes of the researcher, his or her specific skills […] and the nature of the research question and data collected” (p. 4). However, researchers like Max van Manen and Amadeo Giorgi provide some interesting ideas as to how to approach this kind of research.

Max van Manen was influenced by the German tradition of “human science pedagogy” (1990, p. ix) and by hermeneutic phenomenological philosophy. In hermeneutic phenomenology, researchers interpret human experience as though it was a text and the conclusions are presented as texts with deep descriptions of phenomena (Hein & Austin, 2001). The hermeneutic phenomenological approach uses a standard approach for data collection and analysis, but van Manen (1990) has provided his own set of guidelines; he points out that the data can come from a variety of sources and can even include the researcher’s personal experience. All sources are legitimate as long as they help the phenomenologists understand the phenomenon in question. For analyzing the data, van Manen (1990) suggests conducting a thematic analysis to untangle the “experiential structures of experience” (p. 79). The final outcome of this analysis is a document that explains the meaning of human phenomena and the lived structures of meaning; van Manen (1991) also uses anecdotes as examples of insights that help to capture experiences.

Giorgi’s (1971) field is phenomenological psychology, where the goal is to come up with factual descriptions of human experience. His analysis of the data is more systematic and rigorous than the one used by hermeneutic phenomenologist, and his approach is empirical because it utilizes factual data collected for the purpose of examination and explication, whereas hermeneutic phenomenology uses a more creative approach and does not always utilize factual data.

However, both van Manen (1990) and Giorgi (1985a) use some kind of imaginative variation in a reflective process to better understand the themes while analyzing their data, and both of them are interested in unraveling distinct human experiences.

Phenomenologists are interested in the subjective as a way of understanding the phenomena itself; “phenomenology as a research methodology focuses on finding the essence of the phenomenon rather than the essence of singular experience” (Gibson & Hanes, 2003, p. 193). Van Manen utilizes data to produce a text and Giorgi utilizes data to produce a general statement, but both want to represent the essential structures of the lived experience of the phenomenon.

Phenomenology involves different types of experience that can bring together social activity, emotion, thought, reflection and awareness, which according to Husserlian phenomenology, require a level of intentionality which will give meaning to the experience: “the central structure of an experience is its intentionality, the way it is directed through its content or meaning towards a certain object in the world” (Woodruff, 2013). Phenomenology studies conscious experience and consciousness is that which involves certain awareness as we live through it, and what allows us to interpret it by detailing the significant features of its context; phenomenology is the study of a conscious experience as it is experienced.

In this study I use phenomenology as a descriptive methodology, which explores and describes ‘lifeworld’ learning experiences. I look for the meaning of a phenomenon by uncovering, as much as possible, the many layers that socially and culturally influence a person’s experience in their lifeworld, where lifeworld is defined by Van Manen (1997) as “the world of immediate experience”, the world as “already there” (p. 182).

However, in order for things to present themselves in the lifeworld of an individual they have to be part of the consciousness of a person in order for that person to acknowledge them. If this is not the case, then they cannot be part of the lifeworld of a person. Manen (1997) and Giorgi (1997) also point out that consciousness is intentional and, therefore, in order to explore a given phenomenon in the lifeworld of a person, one must research how it is manifested in the consciousness of that person. They view intentionality as the inseparable connectedness of the human being to the world. One must keep in mind that human agency is always oriented but that intentionality is not always conscious: “Intentionality is only available to consciousness upon retrospective reflection” (Mostert, 2002, p. 3).

The final goal of phenomenology is to seek the essence, the true being of the "things for themselves" as opposed to how they are experienced in the lifeworld. Van Manen (1997) defines essence as that which makes a thing what it is before cultural and social meanings are attached to it. To find the essence, the researcher must examine a phenomenon by first asking, what is it like? And afterwards, what is it like for me in my world? It is through reduction that researchers look for the essence of the phenomenon. “As we then explore the lived experience within the lifeworld, bringing the phenomenon to consciousness and being aware of intentionality, we attempt to reduce reflection beyond the immediate context and aim to discover the essence or essentialness of the phenomenon. This is the fibre of phenomenology” (Mostert, 2002, p. 4). For this reason the phenomenological researchers must provide rich descriptions of the phenomenon and within its context (Kensit, 2000).

According to Woodruff (2013) early phenomenologist practices consisted of three different methods:

- Rich descriptions of lived experience (Husserl and Merleau-Ponty);
- Use of relevant features in the context to interpret the experience (Heidegger);
- Analysis of the form of a type of experience.

One can combine all three to analyze the description of the lived experience, and to interpret it by assessing and using the relevant features in the context and analyzing structures within the experience which resonate with our own experience—that which one can be conscious of.

As mentioned, there is more than one way to do phenomenological research, and so in looking for a suitable model I will be using in my analysis a simplified version of Hycner’s (1999) process used by Groenewald (2004) together with the following steps delineated by Van Manen (1997):

- Investigating and describing experience as we live it.
- Bracketing: researcher must bracket presuppositions in order to remain true to the phenomenon

- Phenomenological reduction: reflecting on the essential themes which characterize the phenomenon;
- Delineating units of meaning by extracting those narratives that throw light on the researched phenomenon (Creswell, 1998; Hycner, 1999).
- Clustering of units of meaning to form themes: units of significance are created by grouping units of meaning together (Creswell, 1998; Moustakas, 1994; Sadala & Adorno, 2001).

In this study I describe and analyze as much as possible the setting and the social and cultural elements that could influence and are relevant to the teachers' learning experience while they are being inducted to a new mathematics program. I provide descriptions of the sessions, and even though I am not able to do it "without being obstructed by pre-conceptions and theoretical notions" (Van Manen, 1997, p. 184), I try to provide as much information about my own perceptions and preconceptions of the situation and theoretical notions to provide the reader a sense of my on biases.

In phenomenological research one may consider all aspects that imprint our human experience: culture, society, education, relations, etc. Such research studies experience as we live it rather than as we conceptualize it, and it makes a distinction between appearance and essence and provokes in us a way of relearning in how to look at the world by reawakening our elemental experience of it (Merleau-Ponty 2012). Personal knowledge, personal perspective and interpretation are elements that form the bases of the phenomenological approach and as such it can provide us with an insight into individual's actions, engagement, wants, and motives. Phenomenological research can expose individuals' perspectives from an experience.

Phenomenological research is more than an instrumental methodology and calls for an inquiring researcher who is invested in deciphering the internal structures of meaning. There are no hypotheses that guide the work, so the intent of the research is not to prove or to demonstrate; phenomenological research deals with the significance and meaning of "that which can become manifest, visible in order to problematize and deconstruct a phenomenon and to grasp its construct" (Espósito, 1997, p. 79). According to Rezende (1990), as we speak we acquire awareness because we are not only speaking

to others, but also to ourselves, and it is through apprehending the thoughts of others through talk that we learn to think accordingly. Thought and talk are indentured in a way that “the meaning is rooted in talking, and talking is the externalization of meaning” (Merleau-Ponty, 2012, p. 247).

As a professional developer who has multiple experiences of the lived-in phenomena of professional development sessions, I usually focus on teachers’ engagement. I care about what it is that the participants talk about and how they communicate during these sessions as they engage, in order to get a better sense of how successful my intervention has been in providing a learning opportunity for the participants. Engagement plays a significant role in how conversations evolve and how they lead to instances of learning (Reeve, Jang, Carrell, Jeon, & Barch, J. 2004).

Engagement

Engagement is usually viewed as motivated behaviour that can be catalogued by the variety of ways individuals act during learning opportunities, which seem to depend on the cognitive, metacognitive and sell-regulatory strategies they use to monitor their learning process (Pintrich, et al., 1993; Pintrich & De Groot, 1990; Pintrich & Schrauben, 1992, Pintrich, 1999, 2003). Shernoff, Csikszentmihalyi, Schneider and Shernoff (2003), in their study on optimal states of learning, found that individuals may participate in some activities but they may still be disengaged in *learning*. However, this study indicated that joy was one of the main components that would improve the quality of engagement and consequently the level of learning (Shernoff, et al., 2003).

In the case of teachers, there are also behaviours or ‘types of engagement’ that they may exhibit and that sometimes can give an observer a sense of whether learning is happening or not. However, Harris's (2008) extensive review of student engagement explains the challenge of delineating this concept: "While there is general agreement that student engagement produces positive outcomes, defining the concept is problematic as there is disagreement about what counts as student engagement" (p. 58). This perception also seems true for teachers, but research for this population is almost non-existing. Many academics view engagement as a multidimensional construct, though most studies only

look into one aspect of engagement. Fredericks, Blumenfeld and Paris (2004) classify 44 engagement studies into behavioural, emotional and cognitive categories, where behavioural engagement refers to participation and emotional engagement refers to attitude. Cognitive engagement is when the individual invests time and focus in learning. Researchers have been working on providing a typology of engagement, mainly on students, but there is still no consensus (Fredericks, Blumenfeld & Paris, 2004; Anderson, Christenson, Sinclair & Lehr, 2004). Harris (2008) also points out that there is no real consensus about what aspects of engagement are more important for learning compared to others. So it seems that engagement is a difficult term to define because of the many things that it encompasses, but many of us are able to point out when a person or a group is engaged. As a professional developer I have become aware of some of the possible strategies and issues to attend to that could help in inciting active engagement among participants of a professional development experience.

In working with adults, and from researchers like, Lindenman's (1926) and Knowles' (1990), I learned that adults' orientation to learning is life-centered and so they have a real need to be self-directing in their learning. As a professional developer, one hopes to have an effect on teachers' learning, but, in order to have an impact, one must be able to tend to teachers' wants while at the same time fulfilling as much as possible the planned expectations for the sessions in terms of what I expect teachers will learn: to be able to successfully navigate the space between what the teachers want and the professional developer wants.

Remillard's model and this study's framework

As a professional developer I usually come to a session with an initial plan which I hope will engage teachers, and I observe what takes place. If necessary, I usually use my experience to modify my strategy to try to get a level of engagement conducive to learning. To analyze my data I needed a theoretical framework that would allow me to describe the lived-in experience of teachers' engagement in a way that will model my approach to professional development. For this reason I use a model based on Remillard's (2012) analytical perspective, which connects positioning and engagement in order to analyze the various ways a professional developer tries to position teachers in an experience that

is engaging to them. Remillard (2012) developed a model to analyze various methods that curriculum developers use in order to make their manuals and textbook materials attractive to teachers. Remillard's model is inspired by Ellsworth's book *Teaching Positions* (1997), which is based on analyses of film studies where assumptions about the audience's background influences the structure of the film's narrative in order to maximize their interaction with or attention to the film. On a film the goal of the director is to position the audience in a way to facilitate interaction and that this is something the audience wants to do of their own volition. Remillard (2012) uses her model to analyze how teachers develop a relationship with the concepts or ideas contained in the curriculum resources. She focuses her study on textual resources and her model is based on the idea of positioning and Rosenblatt's (1982) theory of transactions with texts. She classifies positioning and interactions by using the following terms: *mode of address, forms of address, modes of engagement,* and *forms of engagement*. In this study this classification will be used to analyze not only interactions with text, but also the interactions between teachers, the professional developer and a variety of resources and activities.

Modes of address (MoA) are ways of positioning an audience with the goal of initiating a specific interaction, for instance, to position teachers in a place where they can enter into a relationship with the resources, tasks or activities the professional developer would like them to work with, and not only that, but also to do it in a way so the teachers are motivated or want to do it. In this study, *mode of address* will refer to the initial plan the professional developer puts in place in order to engage teachers in learning as well as the way the professional developer re-directs or continues with the original plan, given the level and type of teachers' engagement. Interestingly, Remillard makes the point that this positioning is "problematic in its shaping of the relationship around power and authority in the interaction […] [M]odes of address do not merely speak to an intended audience, but actually seek to assert control over that audience or to enlist a particular kind of participation" (Remillard, 2012, p. 107).

Some think the job of the professional developer is to entice teachers to want what they should want. The reality is that, in a way, the professional developer seeks to assert a level of control over his or her audience by enlisting a particular mode of participation that Remillard calls *mode of engagement* (MoE). Remillard argues that modes of address

(MoA) are not neutral and that the drive behind them is to “sell” to teachers a particular way to do their practice and to learn a concept. I would like to see professional development practice mainly as coaching. The truth is that most professional developers have some specific ideas about what they would like to achieve at the end of a session. As discussed in Chapter 2, teachers are most motivated to engage when they feel they have control over their learning process. So what does the professional developer need to do in order to obtain the desired results and have teachers fully engaged, while at the same time having teachers feel that they have control over their learning?

In particular, in the cases presented in this study, one can see examples of how providing the teacher’s guide, textbook, and other resources in a program is usually not enough to engage most teachers in the use of the curriculum materials to be implemented. Researchers like Lloyd (1999), Adler (2000), Remillard (2005), and Gueudet and Trouche (2009 & 2012) have studied how curriculum resources are used by teachers. They concur that their implementation is not a straightforward process, and depends very much on the interaction of the teacher with the resource.

Remillard calls the physical forms of textual resources used for a curriculum *forms of address* (FoA). However, I use this term not just for the textual resources but rather for all the resources that teachers interact with as they engage in professional development activities, which could include videos, mathematical games, computer sites, etc. I extended the list of resources because of their use in professional development practice.

Remillard uses the term *forms of address* (FoA) for the physical means through which resources address teachers. For example, if the resource is a text, one would need to look into how the information is structured, and what the authors’ expectations are. According to Remillard (2012), forms of address are powerful mediators of teachers’ engagement, and she mentions five main characteristics to consider when analyzing or describing *forms of address* (p. 110):

- *Structure:* here we look at the content and the organization;
- *Look*: mainly refers to the physical appearance of the resource.

- *Voice*: how the designers of the resource communicate with their users about their intentions in the use of the material, and if the intentions carry through (let us not forget that the relationship is between the teachers and the resource, not with the author);
- *Medium*: how the resource is delivered: print, video, website, artefacts, etc.; and,
- *Genre:* Remillard usually uses this term to refer to textbook use, using Otte's (1986) idea "that texts have both objectively given structures (what can be seen) and subjective schemes (ways of being understood or expectations upheld about them)" (Remillard, 2012, p. 113). Teachers' expectations about specific texts or curricula influence the way in which they approach them. In this research, genre will not only refer to text but also to ideas or concepts (fractions, decimals, multiplication, etc.) to be discussed during the professional development sessions and the expectations regarding those particular genres will influence the way in which teachers will engage with particular *forms of address*: "[g]enre precisely presupposes much of what can be expected in the kind of communication in question" (Ongstad, 2006, p. 262).

Adler (2000) argues that school mathematics is a hybrid practice that combines academic and everyday mathematics and that resources used at schools originate from academic and everyday mathematical practices, but are mostly 'de-located' from their original context and then relocated into the context of school mathematics (ibid, p. 209). According to Adler and Bernstein (1996) this de-location/relocation can make instruction more complicated as the teacher mediates the use of these resources. Adler (2000) states the importance of understanding that resources are there to support mathematical learning, and that, in a way, they need to be both visible (teachers and students have to be aware of their existence) and invisible, "no longer the object of attention itself, but the means to mathematics… a function of its interaction with the meaning" (ibid, p. 217). He agrees with Lave and Wenger (1991) in that resources are artefacts of mathematical practice and they need to be perceived as transparent, where transparency is not a primary property of the resource but of how, in this case, it is used in mathematical learning, and where transparency is understood as a balance between visibility and invisibility. In other words, "the functioning of a resource in and for school mathematics lies in its use in context, and not in the mere presence of the resource" (Adler 2000, p. 221), and we should be careful in not allowing for the resource to "become the object but just the means of learning" (p. 219).

Teachers should find the balance between the visibility and invisibility of resources as they use them: “If there is to be access to a practice, then the resources in the practice need to be transparent. They need to be visible, seen so that they can be used and so extend the practice. But they also need to be invisible, so that they allow smooth entry into the practice” (Ibid, p. 214).

Forms of address (FoA), can strengthen or weaken *modes of address* and the way in which teachers will interact or engage with particular resources, what Remillard calls *modes of engagement* (MoE) —how teachers inject meaning to these forms. As I mentioned before, Remillard only analyzes engagement with text forms; I expand this model to include other forms like the use of videos, computers and workshop activities. Remillard just looks at the transactions between an artefact, in her case a text, and the teacher. In my study, I analyze teachers' engagement as a reaction to artefacts and the professional developer's mode of address (MoA). Why engagement? Because, as Remillard (2012) states, “a teacher’s mode of engagement reflects her beliefs and epistemological stance” (p 116). In fact, the professional developer could become a form of address, and teachers can respond to her.

Since professional developers use a variety of *modes of address* (MoA), they should also develop a deep knowledge and appreciation for the form and the look of the resources used: *forms of address* (FoA) (Remillard, 2012). Teachers’ engagement with a variety of forms of address (FoA) will influence how they use those forms in the future. Remillard describes *forms of engagement* (FoE) as the forms and kinds of engagement that teachers assume or adopt. She includes in her forms of engagement the different kinds of reading approaches a teacher could utilize. For example they could read a resource looking for activities or looking for big ideas*. Forms of engagement* are the resulting re-sources produced as teachers engage with resources in a particular way. As modes of address are connected to particular forms or resources (*forms of address*), *modes of engagement* also connect to *forms of engagement*, which will reflect on how teachers act/react and their ‘take-up’ of the process.

In this study I changed Remillard’s definition and I view forms of engagement as the ways in which teachers re-source the resource (*forms of address*) as they engage with

them. Here I use Adler's (2000) "conceptualization of 'resource'" as both a noun and a verb; as a verb "re-source" will connote to source again or differently, and "source" will denote origin (p. 205). By looking at it in this way, a resource can be an artefact, but in addition, I am also able to look at how teachers select, interact and work with resources by adapting them, revising them and re-organizing them, as well as how "design and enacting are intertwined" (Gueudet & Troche 2012, p. 24).

As stated before, teachers' engagement correlates strongly with teachers' goals wants and motives. Liljedahl (2014) developed a taxonomy of teachers' wants, which adds an additional dimension to the framework used in this study and supports our analysis of teachers' engagement during the professional development sessions; the taxonomy includes:

- *Resistance:* there are teachers who do not want to participate in professional development sessions, their contributions are minimal if any, and in some cases they are defensive or challenging. This is not necessarily a permanent condition and there are ways in which the professional developer can change resistance.
- *Do Not Disturb*: here teachers want to improve their practice by learning some new things or teaching strategies and by adding some additional activities to their repertoire. However, they do not want to change their practice much.
- *Willing to Reorganize*: here teachers are willing to look at new curricula and resources and to reorganize their teaching around these new resources but the changes are more "clerical" in nature rather than deeply pedagogical.
- *Willing to Rethink*: teachers are open to "a complete rethinking of significant portions of a teaching practice" (Liljedahl, 2014, p. 6). Teachers are open to changes in pedagogical styles and to being critical of their own practice.
- *Out With the Old*: these teachers have a sense that what they have been doing is not working. They are looking for new pedagogical ways of approaching learning and they are more than happy to work with completely new materials and ideas.
- *Inquiry:* here teachers are more interested in learning and questioning new ideas about teaching in order to have a better understanding and knowledge about a variety of teaching practices and their possibilities.

This study describes a variety of modes of engagement based on particular behaviours that teachers exhibit at particular moments during the session. These modes are guided by teachers’ wants and motives, and crystalize in a variety of ways. The particular forms and modes of address run within a particular background of goals, motives and wants from all the participants involved including the professional developer. Particular modes of engagement follow where the teachers may display a variety of levels of activity with resulting forms of engagement. As I, in the role of a professional developer, observe and reflect upon the resulting modes and forms of engagement, I respond accordingly either by continuing or modifying the current mode and form of address. Modifications depend on how much the professional developer is able to perceive a level of learning where hopefully the teachers' and professional developer's motives, wants and goals are addressed and realized.

Chapter 4. Methodology

This chapter provides a detailed description of the background in which this study was conducted and how the data was collected and analyzed. As stated in previous chapters, this study made use of the phenomenological paradigm in order to provide a deep description of the fluid nature of professional development opportunities. Phenomenology is naturally suitable for this study because of its objective, which is the exploration of these opportunities for learning as they occurred. Phenomenological descriptions and interpretations can help us assess the relevant context of the experience and "turn to wider conditions of the possibility of that type of experience" (Woodruff, 2013).

I want to clarify the existing tension between the two roles I negotiated during this study: my role as a professional developer and my role as a researcher. As a professional developer I am just doing what a professional developer does: planning sessions, figuring out how to position teachers into doing what I want, checking on the level of activity and the mood of the session; my attention is on the teachers. As a researcher, I shift my attention to me, because this analysis is not about me as a researcher in the professional developer mode; it is about me doing research on this experience, and recognizing that in this process I am a professional developer and it is only in the analysis that I start to see my behaviour. My analysis has as much to say about the teachers as it does about myself. First, I took the role of the professional developer, and afterwards the role of the researcher when the phenomenon that occupied this study was already done and I started to analyze the data.

School administrators and teachers are socially constructed individuals (Hargreaves 1994 & 2001), and this research seeks to describe complex interactions that are embedded in context. I begin this chapter with a thorough description of how this professional development opportunity came about, the constraints that participants and the professional developer had to work with, and how methodologies were planned and changed according to what was possible to do given the guidelines and timing provided by the school administration. I also provide a short description of the mathematics program that was being implemented at this particular school.

Background

The participants in this study were the teachers involved in the professional development sessions, and myself as the facilitator. As the professional developer, I am also a participant because my reflections and responses to teachers' engagement as well as my motives and wants are part of the study.

A school-wide mathematics program was being implemented at a school in the Lower Mainland in British Columbia, Canada. Thirty teachers at the school participated in the professional development sessions, all of them except for one agreed to be a part of this research. The teachers were divided into seven groups corresponding to the grade they were teaching—Kindergarten to Grade 6—and the professional development sessions were offered to each grade individually. There was never a session where two or more grades worked together, except for the introductory session where I gave an overview of the program and all the teaching staff at the school attended. Each group was composed of three to five teachers and the dynamic was different in each group, although in general each group seemed to have a leader and a second in command. It should also be noted that participation in the professional development was mandatory.

The school principal contacted me as I had experience with implementing the new program, Singapore Mathematics, to see if I would deliver a series of professional development sessions. Before I started the professional development sessions, the principal sent a message to all the teachers stating that I was going to deliver these sessions and also that I was doing a study for my dissertation. She asked them to cooperate with me on whatever I needed. During the first session I had with every grade group I gave them the research participation forms. I reinforced that the principal's request did not mean that they had to be part of the study to participate in the sessions, but that I would appreciate it if they would help me by being part of my dissertation research. As I mentioned before 29 out of 30 teachers agreed to participate. Participation in the professional development program was mandatory, but not in the study. There was resistance from some teachers regarding participation for various reasons, and things did not always go as I hoped. I will be mentioning how this affected the sessions as I further describe my methodology and in my data analysis.

Singapore Mathematics: a short introduction

In the following section I mention some of this program's major characteristics for necessary background information. For the more interested reader, there are a variety of comparative articles available, such of those of Ginsburg, Leinwand, Anstrom & Pollock, 2005. I do not perform an analysis of the textbooks used by the program that was being implemented at the school because this is not the focus if this study. However, in general, the Singapore Mathematics program centres its priorities on problem solving aided by an expected fluency in computational skills, the development of a variety of heuristic strategies, and a thorough understanding of algorithms being used. The central goal of this program is to develop students' ability in mathematical problem solving.

Like most Asian programs, Singapore Mathematics's framework covers a smaller number of topics per year than what until recently the Canadian and American curricula would cover. As a matter of fact many math programs in North America have lately cut the number of topics students need to study each year in mathematics because the case was made that mastery of fewer concepts was a better way of learning and retaining mathematical knowledge than a survey of many concepts. In this Singapore program, the mathematical topics are carefully sequenced grade by grade, and students are expected to master the mathematical concepts being taught before moving on. It is also assumed that what was taught in previous years has been solidly learned. Concepts introduced at one grade are later explored at higher grades, but only in order to be applied at a more advanced level.

Proper implementation of the Singapore program provides teachers with an awareness of its rich problem-based development. Definitions and formulas are a part of this program as well, but in many cases students' work consists of developing and/or discovering formulas or mathematical ideas in order to acquire a full understanding of the topic at hand. The Singapore program utilizes concrete, pictorial and abstract methods, which provide students with an approach to recognize, decompose, represent, illustrate and solve the various parts of a problem.

The Singapore program identifies five main components that we need to tend while developing students' problem-solving skills (Ministry of Education, Singapore, 2001):

- Students are expected to learn and connect concepts that relate to the content.
- Students are expected to develop a fluency regarding a variety of procedural and calculating techniques when solving problems.
- Students must be knowledgeable of a variety of problem-solving strategies which include thinking skills and heuristics.
- Students must develop metacognitive skills to guide their learning.
- Students must develop an appreciative and positive attitude towards mathematics and a relentless disposition in problem solving.

Singapore Mathematics's framework recognizes four main mathematical content areas in primary school: numbers, geometry, algebra and statistics (Ministry of Education, Singapore, 2001).

Textbook use in the classrooms is an essential element in the delivery of the day-to-day instruction, since the textbook guides the priorities, topics and outcomes, providing rich mathematical content that aligns with the curriculum framework and prescribed pedagogical approach. The textbook and materials that go with it provide ample amount of exercises and problems for students to practice their mathematical skills. However, this has been an issue with teachers in North America who are used to voluminous textbooks and feel that the "skinny" Singapore Mathematics textbooks do not provide enough problems for practice, and many of them supplement with problems from other sources.

The Singapore Mathematics textbooks are unlike those usually used in US and Canadian schools. The textbooks are not hardcover but paperback, with simple illustrations of a boy or a girl accompanied by an idea box that provides problem solving hints. Singapore texts consist of two textbooks and two workbooks for each grade with about 130 pages each with a cost of $4 in Singapore and $11 in the US and Canada. The textbooks have no goal or relevance statements at the beginning of the lesson, and no special sections on real world applications. It is just a straightforward presentation of the mathematical concepts, which is usually an elucidation of a concept, followed by an example, a discussion or questions about the example, and then a series of exercises to reinforce the learning of the concept. Usually these exercises or problems present different perspectives in which the concept learned can be useful in developing a solution. This

presentation helps students learn to make connections using a variety of mathematical ideas in routine and non-routine contexts. On average, each lesson corresponds to about 15 pages of Singapore materials (Textbook and workbook), which translates to 15 to 25 lessons per year. Students are expected to cover approximately one single topic thoroughly per week or week and a half.

In Singapore Mathematics the first explanations usually begin with manipulatives and physical or pictorial examples on which abstract ideas are built. These elements not only help students who have difficulty with abstract concepts (Maccini & Gagnon, 2000), but can also give students a general idea about the connection between mathematics and the real world. This program also uses the bar model representation, which can be very useful in helping students visualize the various parts of the problem, the equations involved, and of course, the solution to the problem. There is substantial use of diagrams and models in order to demonstrate different ways to approach the same concept and they also contain a set of exercises, which are not repetitive of the same kind of thinking but, rather, demonstrate how with the same mathematical idea many problems can be solved. These problems become increasingly complex. Concepts like addition, subtraction, multiplication and division are taught together and the workbooks provide supplementary exercises.

There have been several pilot programs in the US and Canada with mixed results. The main problem in the implementation has been the teachers' inadequate mathematical knowledge (Schmidt, Zoido & Cogan, 2014).

About a third of the teachers at the school had already been using this program's textbooks and workbooks, but only one of them had looked at the teacher's guides and had been using the program as the developers had intended. The rest, who had used only some of the resources, had done it without the benefit of the teacher's guide, and had mainly used the textbook and workbook as sources of problems or exercises to give to their students.

First General Session: introducing the program at the school

I had the opportunity to talk to the principal and the two teacher leaders of the elementary school four times prior to the start of the field work. During these meetings they told me that they wanted to implement Singapore mathematics because some teachers at the school had suggested it as a good mathematics program, and they wanted to know if it was possible to implement this program at their school, and how. I also took the opportunity to ask them questions about the school such as how many teachers, schedules, and school teaching philosophy. They were the only teachers with whom I was in contact before the first general presentation, which was done in December. The professional development sessions conducted by grade started in January of the following year and ended the last week of April. As an introduction to this program, I gave a power point presentation for all the teachers at the school, which touched on the following points:

- I talked about the program's past success and studies made about it (for example, Mullis, et al. 2004).

- I talked about the various schools in Canada and the US where this program has been implemented: the challenges faced and the level of success.

- I explained how this program focuses its priorities on problem solving aided by an expected fluency in computational skills, development of a variety of heuristic strategies and a thorough understanding of algorithms being used. I also explained that it contains rich problem-based textbooks, which are not repetitive, but increasingly challenging and insightful.

- I showed how the curriculum framework covers a smaller number of topics per year compared to Canadian and American curricula.

- I showed that the mathematical topics are carefully sequenced grade by grade, and that students are expected to master the mathematical concepts being taught before moving on. In this program it is assumed that what was taught in previous years has

been learned by the students. Concepts introduced at one grade are later explored at higher grades, but only to be applied at a more advanced level.

- I explained that although the elementary books in the program go all the way from Kindergarten to Grade 6, the material covered in Grade 6 in this program is usually covered in Grades 7 and 8 in the British Columbia curriculum. What is usually done in Canada and the US is to spread the use of Singapore resources from kindergarten to Grade 7 or 8.

After the presentation I also introduced the bar model, a visual representation used by the program for problem solving. I usually do this by asking participants to first solve eight problems, and while they are solving them to also think about how they would present the solutions to their students. After a few minutes, I asked some of the teachers to share how they had solved some of the problems. I followed this activity with another presentation about the Bar Model, where I proceeded to show them how to solve the problems I gave them before using bars that model the problem to be solved. Next, we discussed the advantages of using this model versus the way they previously solved the problem. There are usually many “Aha!” moments happening when we start solving problems using bars and usually most teachers want to learn more about them. In this session, none of the kindergarten teachers actively participated during the presentation, but I received positive comments from them. I talked to Jane (one of the Kindergarten teachers) after the presentation, and she liked it, but she was worried about her mathematics skills. She told me that she liked mathematics but she wished that she could feel more comfortable with her level of mathematical knowledge and that she could see how the bar model could help her.

For each grade the program has two textbooks, textbook A and textbook B, each of them to be covered in approximately one semester. But in order to spread the use of Singapore resources, the school was to take a slower pace and some of these textbooks were going to be used for the whole year instead of for one semester. Two possible sequences were discussed and I left this decision to the school about which sequence to follow, which had an impact on some of the teachers. As was the case with Rebecca, one of the Grade 2 teachers, who wanted to know what book she was going to use in her class

since two possible ways of sequencing the material used for each grade was discussed during the session. She stated that she had been using books 2A and 2B and in the discussion it was mentioned that perhaps it was better to have teachers in Grade 2 teach just the material in 2A and that Grade 3 teachers should teach books 2B and 3A. She was not happy about this possible change, and she showed her unhappiness about this issue, which she mentioned during the sessions and had an impact in her participation and the participation from the rest of the Grade 2 group.

Initial steps and setting

It is seldom the case that professional development is done under ideal conditions, or done in the way in which the professional developer believes is the best way. There are always constraints about how to carry out professional development sessions, which in some instances may have a significant impact on the facilitator initial plans. This study was not an exception and plans changed for a variety of reasons, some of which will be mentioned here.

Setting and time

My first recommendation was to do professional development through lesson study. I strongly believe that this type of professional development provides a good approach to develop teachers' learning at the pedagogical and content level. I explained the process to the principal and to the two teacher leaders who usually help her run the school. Research on lesson studies has shown that through consistent examination of teaching practices and their effects on students' learning, teachers are able to change and improve their instructional practices (Watanabe, 2002; Fernandez & Yoshida, 2004; Becker et al., 1990, Takahashi, 2003, 2000).

Lesson study is a professional development practice in which teachers are able to systematically examine the effectiveness of their practices, and learn how to improve them by working together as a team in planning, teaching, observing, and critiquing lessons. Teachers working together produce a lesson plan that includes an explanation of the goals, how the goals might be achieved by the lesson, how the main topic in the lesson is

related to other topics in the curriculum, and how the lesson will be assessed. Once the lesson plan is developed, one of the teachers teaches the lesson, and other teachers from the team or the school are invited to observe. After the lesson, there is a debriefing about the lesson where the teachers who prepared the lesson as well as those who observed it discuss it. This process allows teachers to familiarize themselves with a variety of ideas and classroom practices used to teach a mathematical concept, resources and to have deeper discussions about a variety of mathematical ideas. However, Wilms (2003) and Watanabe (2002) mention that lesson study is not only a professional development activity, but a culture, and as such, there are aspects about lesson study which some teachers in our culture resist. The main one is being watched by other teachers as they deliver a lesson. One should note that the reason for observing the lesson is to provide constructive criticism and feedback.

Together with a group of teachers, mathematicians and educators, I had, for several years, conducted lesson study sessions at the University of British Columbia (UBC). In the beginning some teachers were also worried about being observed, but those of us leading the sessions made it very clear that we were not criticising the teacher but the lesson. As a lesson study facilitator, one has to be very careful of the way in which constructive criticism is delivered during the debriefing, and we provided a set of rules to make it impersonal but factual. Our experience at UBC with several teachers was mostly very positive as they could see that the constructive criticism that they were getting was very useful for their practice. There needs to be openness towards constructive criticism, which is not an easy task to achieve in a Western culture.

Despite my assurances, this methodology was not accepted at the school where the implementation was to take place, since I was told that some teachers would feel uncomfortable about ‘being watched’ while giving a lesson. Even when I asked to observe some of the teachers in their classroom, many of them objected, openly stating that they did not feel comfortable with anyone watching. I explained to all teachers that the reason I wanted to observe them during their math class was to learn more about their practice in order to be able to provide better support during our sessions together. A few agreed and I was able to observe some teachers from Kindergarten, grade 2 and grade 5.

At this particular school, each grade group of teachers had about forty-five minutes every week to get together for lesson planning in order to exchange ideas or to review what had happened during the week. Teachers used this time to discuss where they were at in particular subjects, to design tests, and to plan for any kind of timing that was necessary to coordinate all sorts of classroom and administrative matters. The principal had planned from the start to use this time for our professional development sessions. The teachers were friendly and polite, but from the beginning I felt that many of them wanted to hurry during our sessions because they wanted to have some time left over to talk to other teachers about administrative matters. Moreover, we were interrupted many times by students coming into the classroom asking questions about matters that could not wait and many times not all the teachers were working with me because they were taking care of other things that came up during this time. I soon realized that what the teachers usually did during this time was important and necessary for each grade to function as a whole.

After three weeks of attempting to get more time with the teachers and trying to stop them from doing something else during the time I was with them, I realized that not much was going to happen if things continued in this way. I made a plan where I suggested having at least six 90 minute long meetings with each grade in order to be able to develop some ideas and give teachers time to focus at a place and time where we were not going to be interrupted. I presented this plan to the principal and, after some discussion, I was told that six sessions would be too disruptive and she asked me to agree on a series of three three-hour meetings with each group. Personally, I thought that three hours would be too tiring for the teachers, since the teachers needed to work with me during that time and the rest of the day they had to work with their students as well. Three-hour workshops can be intense. Having six sessions instead can also provide more opportunities for reflection between sessions; reflection time is key for learning (Costa & Kallick, 2008). I facilitated two three-hour workshops per day and usually the second group of teachers got tired after an hour and a half, since they had been working with their students already for three hours. It seemed to me that they could not always achieve the level of concentration that was required for this workshop for three additional hours.

My experience with this program's implementation at previous schools showed that several teachers did not have the mathematical knowledge needed to use it in their

practice. After meeting some of the teachers at this school, I felt that a good proportion of them could do a good job with this program, so I decided to continue with the sessions even if the conditions were not what I would considered optimal.

Coaching or facilitating

The initial goal was to help teachers get familiar with the mathematics program being implemented at the school, but my main goal was to get teachers to look at the materials in a critical way so that if they were involved in another program implementation, they would look for key facts to get a better idea of its content and pedagogical philosophy. I envisioned myself more as a coach than an instructor and wanted to support the development of a relatively “self-sufficient” community of practice for each of these groups of teachers participating in the sessions. I saw myself as a temporary coach that was there to point out the nuances in the new program and foster interactions among teachers that would help them learn from each other. Further, these interactions would enable them to tackle curriculum changes as a group or individually without calling someone from outside to guide them through the process.

With some of the groups I did more of what I would consider a ‘traditional’ kind of professional development, where I took the lead and made the decisions about which materials to review and how, though I tried as much as possible to ask teachers about what they were currently doing or would be doing in the near future with their class so that we could work with topics that they would be more interested in because of their more immediate relevance to them.

The problem with the way the initial sessions were conducted was that the first impression many teachers had of me was as a trainer. With the rush to get through the materials, and with all the interruptions, I was mainly spending my time telling teachers what to do. I was telling them what to do with the resources, and they seemed to be fine with this arrangement. I was the one who was not happy and this was the reason why I asked the principal for a different time allotment.

After the time allotment changed, each group of teachers met with me between nine and twelve hours distributed across three to six sessions. I started sessions sooner with some teachers, whereas other teachers started working with me a month later.

Modes of address/Forms of address

To begin with, I utilized a variety of modes and forms of address. As I previously mentioned, with some groups I had one, two or three initial short sessions where we mainly had an overview of the resources.

As I started the sessions, I realized that most teachers did not have the resources that were being implemented. Using my own resources, I showed them how the teacher's guides presented the objectives, how each lesson described how to achieve each objective, what the materials were for each lesson, and how to use the textbook and workbook together. This introduction usually took the whole time of the first short meeting.

Initial mode of address for first long sessions

With all the groups I planned to start the first long session with the following protocol:

- First, I asked them about their practice.
- Next, I asked the teachers in a group to explain how they would teach a particular mathematical concept.
- Following this, I provided the teachers with copies of the pages in the textbook and workbook, which dealt with the concepts that were discussed. Teachers were asked to compare between their initial take on the concepts and how they thought materials in the program dealt with it or could be used by them. However, at this stage, I did not yet provide the teacher's guide.
- Lastly, copies of the lesson in the teacher's guide were introduced with the goal of furthering discussions regarding the teaching of the concept. Teachers were asked about any additional or different teaching ideas that were included in the teacher's guide, and if they found them useful, enlightening, or irrelevant for their teaching purposes. It is important to point out that in this particular mathematics program the books and workbooks are geared towards students and the manuals are different from many others in that for most grades (except for Kindergarten) the teachers will not see a reproduction of book pages in the manual. The teacher's guide presents the following information as they introduce a new concept: objectives, notes that inform teachers about what ideas students have learned in the past which will help them introduce the new concept, how to introduce a new concept by using students' previous knowledge (many times with activities that are not in the students materials), how to use the textbook in class to elicit student discussion, and how to use the workbook exercises for practice and assessment. The manual also introduces a variety of hands-on activities geared towards developing understanding in a concrete way.

For some groups the same procedure was done for several sessions, and for others the process changed according to what I thought would be a better way of eliciting engagement on the part of the teachers.

Lesson preparation

My purpose in giving teachers lessons to prepare using the teacher's guide was to encourage them into taking a closer look at the teacher's guide and to get them better acquainted with the program. The first lessons I asked them to prepare were key lessons in the program that I thought would help them get an idea of how to use the resources, how the activities were laid out and also give them an idea about the central philosophy behind the program. The lesson preparation the second time around entail lessons about concepts they would teach in a few days and therefore it would be helpful for them to examine the differences between what they had already planned and what the new program entailed. A further goal was to have the teachers try the new program activities in the classroom. I also wanted to introduce them to a practical lesson preparation, so I introduced them to an article by Akihiko Takahashi (2007) *Communication as a process for students to learn mathematical*, which includes a sample of a lesson plan. I discussed with the teachers some of the main ideas behind preparing a lesson that actively engages students and where students were expected to learn mathematical content by interacting with their peers and their teacher.

In particular I pointed to pages 6 and 7 in Takahashi's article where they could see how a lesson was developed. There were three columns:

- First Column: shows the steps the teacher should take during the activity, the questions he/she should ask and what to do with student answers or expected reactions.
- Second Column: indicates how the teacher can provide further support during the lesson if needed.
- Third Column: indicates what to evaluate throughout the lesson. What the teacher should notice to inform the process in the other two columns?

I have used this article in my practice, and teachers have found it useful. In particular, they appreciate the nuances of the second column where teachers need to think about possible mistakes students can make and to figure out how to support them in order to elicit the kind of learning they will expect in the third column. This article is a good resource that I have used many times to help teachers develop their practice. Having a

good array of resources, most of which I have acquired during my practice, is a valuable tool that has helped me support teachers learning throughout their professional development experience.

Resources used

In addition to the Singapore Mathematics resources, I used the following resources to further bring about discussion about the teachers' practice and mathematics.

- Teaching videos of fun mathematical activities given to children in Japan. These are videos that can be found at: http://www.globaledresources.com/resources.html.
- Videos of lessons from Human Resources Development Working Group at the following website: http://hrd.apec.org/index.php/Classroom_Videos_from_Lesson_Study
- Hands-on activities that they could use the next day.
- Excerpts of the book *Arithmetic for Parents* by Ron Aharoni.

The videos are examples of good teaching practices and of students' engagement, and were shown to the teachers as a form of address to promote professional discussion and learning.

In the last resource, the author points out a variety of subtle ideas that one can generally overlooks in learning arithmetic. I used this book to help teachers reflect on things they believed they knew well. More often than not, they realized there were still things in arithmetic and in teaching methodologies they should know more about. Throughout the professional development sessions I tried to support teachers with both readings and explanations of particular mathematical concepts and ideas that came up during the session.

Data and Analytical tools

Data regarding the actions of teachers in a professional development setting were gathered in order to describe their participation and engagement throughout the sessions. This data collection was done by audio-recording most of the professional development sessions, surveys (Appendix B), and through field notes made by myself, the facilitator, during and after each session about teachers' engagement. After every session I also made notes reflecting on the effectiveness of the session, which concerns were addressed, and the level of engagement. These notes also included my feeling and thoughts, as well as questions that I wished I had asked during the session and questions that I hoped to ask at the next session with the group. This reflective process served as a preliminary analysis of the data (Glesne, 1999). Most observations of teachers' behaviour were made during the professional development sessions. In spite of some resistance, there were seven teachers who allowed me to have a one-time visit to their classroom, and we had discussions after my visit about their practice. I took notes of these conversations and what I observed in the classroom. In addition, two surveys were given to the teachers: one during the first session and another one at the end of the professional development sessions. Most questions were about their practice and their experience with the current and previous professional development opportunities (see Appendix B for surveys). Phenomenological research is about the lived-experience, but that experience is also informed by what we know, which can be informed by previous knowledge with the same or other groups, therefore the importance of taking additional notes about my impressions of the sessions and keeping track of reflective questions, as well as the use of artefacts like the surveys where I asked the teachers questions that will allow me to understand to have a better understanding of their practice.

I collected data from seven groups of teachers. However, for the first cut of my data (Chapter 5), I decided to focus my analysis on just the sessions with the kindergarten and grade 2 teachers and based most of my study on what transpired with these two groups because of the contrast in their level of engagement. Another reason for focusing on these two groups is the nature of the phenomenological research itself: the detailed description necessary in order to describe each session as it was experienced provided a considerable amount of data. If I was to execute a full analysis of what was collected for

all the grades the amount of data would have been unwieldy, as I collected over 90 hours of audio-recording for all seven grades, filed notes, and conducted surveys. However, I did use some excerpts of what transpired with teachers of other grades in order to clarify and support some points of analysis in Chapter 5, and further data analysis as described in Chapter 6.

For the data analysis, I used the following protocol, which is a simplified version of Hycner's (1999) process used by Groenewald (2004) together with some steps delineated by Van Manen (1997), which were described in Chapter 3: First, I investigated the experience as I lived-it, then I bracketed the assumptions being made. As I looked at the data I delineated units of meaning, then I clustered them in themes and I created a composite. I describe them next in greater detail.

Investigating experience as we live it rather than as we conceptualize it

Groenwald suggests that first, the researcher should be open to the phenomenon "in its own right with its own meaning" (Groenwald, 2004, p. 18). In order to do this, I transcribed and put all my field notes together with the transcriptions. Even for two groups only, the amount of data was significant; the transcriptions were long because for each group I had at least 10 hours of audio-recording. I read and re-read each set of transcription notes for the Kindergarten and the Grade 2 group, and also listened to the audios of the other groups and transcribed some portions as well if they provided some significant insights for my analysis. In my initial analysis while focusing on the Kindergarten and the Grade 2 groups, I started to write down the description of each section, I realized that the main aspect I wanted to convey was the flow of communication among the participants, and that just writing what had happened could not transmit that. I was trying to represent the data in a way where one could clearly identify the modes and forms of address and modes and forms of engagement and the teachers and facilitator motives, wants, and learning within the flow of the session. However, on my first attempt, what I mainly came up with was, again, a long transcription of what had happened. I needed to read every single thing I wrote in order to get a picture of what was happening during the sessions. I tried to describe the modes of address and the forms of address that were used and then I

described teachers' engagement, but as I was doing this I was again mainly transcribing the data without getting a real idea of the level of engagement. I wanted to represent, as closely as I could, the experience of the session. How could I represent the teachers' mode of engagement, and the flow of activity of the session? I wanted a way to represent the level of engagement, not just state that the teachers were engaged.

While motivation focuses on the reasons why people act in a particular way, engagement reflects the wanting to continue doing an activity, and in the case of learning opportunities, like the ones provided by the professional development sessions, the level of the engagement is very much an indicator for learning. Also, what I wanted to describe how teachers worked together; this is important because as Bandura's research (1997) points out, "cooperative structures, in which members encourage and teach one another, generally promote higher performance attainments than do [...] individualistic ones" (p. 175).

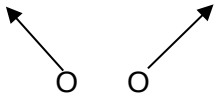
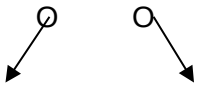
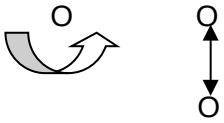
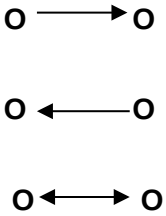
How does one go about analyzing the lived-experience: my first attempt

I asked myself, how could I describe and put together all of these elements without simply creating long, boring narratives? A visual analytical tool would be helpful and I took a look at Sfard (2001) and Sfard and Kieran (2001) interactive flowcharts to help me represent engagement in a real dialogue among the participants.

Sfard (2001) and Sfard and Kieran (2001) use arrows in their flowcharts to indicate participants' meta-discursive reactions to other participant's contributions, and they argue that recurring patterns of these reactions will reveal some kind of regularities that can help us to point out some "reactive and proactive behaviors" (Sfard, 2001, p. 41). Sfard and Kieran (2001) use a vertically or diagonally upward arrow pointed towards a previous utterance to indicate a reactive behaviour, and they indicate proactive behaviour by using a vertically or diagonally downward arrow pointed at the participants from whom a reaction is expected. They developed this coding system for a two-person conversation and Ryve (2006) extended it to include more participants. I extended this symbology by including reflective and supportive utterances indicated by horizontal and double-headed arrows, self-reflecting monologues indicated by the curve arrows, and preoccupations indicated

by the colours of the arrow (Table 2). The introduction of these arrows allowed me to indicate the kind of discourse that Sfard sees as a process that goes from the individual to the community. As mentioned in Chapter 3, the main assumption of Sfard's approach is that thinking is a form of communication, where learning occurs through a modification and extension of one's discourse.

Table 2: Flowchart table description

Type of Utterance	Private	Inter-Personal
Re-active		
Pro-active		
Implicit Agreement or support or reflective		

Different colours were used on the flow chart tables to indicate the kind of preoccupations of motivations behind the interaction.

- Orange: Indicates outside classroom issues (parents' concerns, for example)
- Blue: Indicates the program being implemented
- Green: Terminology and definitions
- Red: Indicates previous practice

- Purple: Indicates additional resources being use by the professional developer (not the ones being implemented, or from previous practice).
- Light blue: Indicates assessment and administrative issues. In this case report cards
- Solid black arrow: New program, previous practice, and terminology all three together at once.
-  Indicates giving a lecture. This is a new symbol, where instead of marking circle as an initiation state, there is a multi-star indicating that the interlocutor is lecturing the rest of the group

Sfard and Kieran (2001) utilized the arrows in the flow chart to indicate how “the participants of a conversation move between different channels of communication (private, interpersonal) and different levels (object-level and meta-level)” (p. 57). They call this kind of analysis *preoccupational analysis*. They used the interactivity flowchart to “evaluate the interlocutors’ interest in activating different channels and in creating a real dialogue with their partners” and with this information they hoped to be able to “make conjectures about the matters that preoccupied the interlocutors” (p. 58). In the flowcharts, I used arrows that indicate different articulations (utterances, or discourses) but I also added other symbols and colours to indicate issues that embody the participants’ meta-discursive reactions to other participants’ contributions. In particular, colours indicate preoccupations, issues, concerns and wants. All these elements are part of the professional development experience. As a facilitator, I know what my concerns are, and for my preoccupations and wants, I coloured the arrows accordingly. However, part of being a professional developer is to read into the conversation in order to sense what teachers are preoccupied with and what they want. I colour my perceptions about teachers' preoccupations and other issues that would influence interaction as I perceived and experienced it. This perception was guided by the teachers’ remarks and their modes of engagement during the conversation.

By using the framework described in Chapter 3 together with these charts, I was able to obtain a picture of the many components that come together to provide an idea of the phenomenon at hand, and the resulting interactions among the participants. Sfard’s and Kieran’s (2001) charts provided a visual representation of those interactions. By adding colour to represent preoccupations and other kinds of arrows and symbols to

indicate not just reactive or pro-active utterances but also supportive and reflective, I could further dig into the ways people communicate with each other, and also have a conversation with themselves through reflection. Points of inflection are easier to spot in these visual representations, as we see a change in the kind of arrows representing the teachers and the professional developer's utterances from just reactive and pro-active to supportive and reflective (Appendix A: Table K.1, Table 2.1).

As I started to analyze the data using Sfard and Kieran's interactivity flow charts, I realized that I needed to include reflective and supportive arrows, because the reactive and proactive arrows did not capture all the types of interactions among the participants. As I analyze ideas communicated and absorbed by the community involved, I saw discourses created through individual reflection and community support. My contribution in refining Sfard's methodology was to include reflective and supportive representations of the discourse.

Using these charts, I analyzed four full kindergarten sessions and three full Grade 2 sessions. An example of this type of analysis can be found in appendix A. What came out of this analysis? The result was long charts and long narratives where the main components were difficult to identify in a practical way due to the substantial amount of information and the way in which it was presented. The visual representation was informative but there was too much information to deal with and one needed too much time to read everything carefully to come up with a clear idea of what had occurred during each session and why. Was this a failure? Yes and no. Going through these narratives with an open-ended perspective allowed me to notice a variety of components and ideas. Some of them informed my final framework and others gave me ideas that I can foresee working on in future research. For example: In the future, I would like to find out what are the patterns of behaviour among teachers when a specific mode of address is applied.

As I analyzed the lived experience, I was also aware of the other steps in the Groenewald (2004) and Van Manen (1997) protocol, some of which I included in the analysis.

Bracketing: In order to remain true to the phenomenon, I repeatedly listened to the audio of the sessions, and read my field notes to try as much as possible to get a real

sense of what had occurred, and not to let my own feelings or assumptions take over the description of what happened during the professional development sessions (Groenwald, 2004; Hycner, 1999). However, there were times, when it was necessary to describe or mention my assumptions and beliefs to provide a better understanding of what took place while I was working with the teachers. I will mention them by first introducing statements like I believe, I felt, etc., where I make it clear that these are my own personal perceptions or opinions.

Delineating units of meaning: This is a crucial step in phenomenological research. Here the researcher needs to use his or her own judgment, while at the same time consciously bracketing her own preconceptions to eliminate subjective judgments as much as possible. As the researcher, I was expected to obtain a list of units of relevant meaning. In my study, the modes and forms of address, modes and forms of engagement guided by the facilitator's and teachers' wants, learning moments and scenarios, provided me with significant units of meaning that in turn provided me with significant emerging themes in my analysis.

Clustering of units of meaning to form themes: I looked at how the units of meaning manifested, as I worked through the data. I tried to look into the core or basic character of these units within the whole context. As I clustered moods, wants with modes and forms of address and engagement in scenarios, themes started to emerge, like how teachers approach curriculum resources for the first time or how teachers will prepare their math lessons using the new resources.

Summary (creating a composite): A composite summary of all the themes presented in the conclusion has to be put together and I, the researcher, had to reflect on and analyze the context from which these themes materialized.

Following the steps mentioned above provided me with a way of analyzing my data as objectively as possible and it is my hope that it will also provide others with a framework to analyze their own professional development sessions.

To study professional development as a lived experience was a great challenge, but when I was finally able to put many elements together to describe phenomena in a

coherent and descriptive manner, I was thrilled. Finally, I just want to mention that as a professional developer, for the group of teachers in this study my main concerns were:

- To address the needs and concerns of the teachers with regard to the new program and any other possible programs and their teaching of mathematics in order to be able to engage them in a pursuit that would further develop their practice and mathematics content knowledge;

- To provide opportunities for teachers to take risks in sharing their beliefs, knowledge, and difficulties with mathematical content, especially during their practice with their peers;

- To be able to have sufficient time for the teachers to learn and maintain their learning;

- To have a discussion with the teachers and the administrators about a long term plan for professional development; and,

- To foster accountability, which became a main concern as the sessions went on their way. Some teachers did let me know that they were really busy and that they could not take much time outside of school time for any kind of extra work that I would ask them to do, or to reflect on the work that we had been doing. There was no real accountability for work that needed to be done, and those who engaged and did some of the things I asked them to do did it because they were motivated to do so.

The next two chapters show that by producing a way to analyze the phenomenology of professional development, I was able to become aware of a subtlety that is not possible with surveys or performance reports.

Chapter 5. Investigating Life as We Experience It.

Background:

As mentioned on the previous chapter, after my field work I had over 90 hours of audio, copious notes and two surveys for my analysis. I needed a framework that could be useful in representing the lived-experience of professional development. Remillard's framework in her article "Modes of Engagement: Understanding Teachers' Transactions with Mathematics Curriculum Resources" (2012) offered the first step. The framework builds on the idea of mode of address (MoA), which are highly dependent on the format and the design of the curriculum materials, which she classifies as forms of address (FoA). She provides examples of how as the teachers are positioned (lined up towards a particular approach) by a mode of address (MoA) using forms of address (FoA), they take a distinguishable stance (attitude/posture) which she identifies as the mode of engagement (MoE). In a manner similar to the modes of address, modes of engagement can be accompanied by forms of engagement (FoE).

I realized that I could use her framework, with some modifications, not just to analyze the relationship between the teachers and text materials, but to analyze the lived experience of professional development. I envisioned the mode of address (MoA) as the plan the professional developer has devised in order to position the teachers on a learning path. As the film director wants to capture his/her audience's attention by using an appropriate mode of address, the professional developer needs to make the appropriate assumptions about his/her audience to obtain the desired results. After choosing the MoA, it would be necessary to choose an artifact to further that plan (FoA), watch the teacher's engagement (MoE) and see what emerges from that engagement (FoE).

Remillard gives special importance to the forms of address, that is, how the format and form of curriculum materials determine the teachers' interaction with these resources. In this study of professional development, forms of address are not just texts, there are videos, games, manipulatives for activities; and as I discover during my analysis even reflective questions can be a form of address. In my analysis forms of address include

anything that can expand and extend thinking and promote collaborative dialogue (Barnett, 1987, Lee & Barnett 1994).

Forms of engagement, as well, do not need to take a physical form, as I initially stated in my framework (Chapter 3); as I analyzed the data I realized that they did not necessarily have to be material objects (resources) being produced by the teachers' mode of engagement, but they could also be comments or ideas brought forward by the teachers. Further, the form of engagement was an immensely useful tool that could provide a professional developer, with key information about the success or failure of the endeavor and/or the direction to proceed.

As mentioned on Chapter 3, the form of address includes aspects which are usually interrelated like structure, look, voice, medium and genre. These aspects in turn have an impact on the mode of engagement (the manner in which the teachers engage) with the forms of address. But what else influences how the teachers engage? Remillard points out "that generally teachers have a stance toward curriculum materials that is influenced by their views about mathematics, teaching, and the role that curriculum resources can and should play in the process of teaching mathematics" (Remillard, 2012, p. 109). The personal background of the participants, the situational context of the professional development sessions influenced by the wants, and the motives coming from all the participants including the professional developer, will have an impact on how the teachers engage.

Teachers' engagement in an activity can provide a good source of information regarding their learning and their practice (Spillane, 1999). As mentioned before, the literature identifies level of engagement as a way to find out the success of a particular opportunity for learning. However, in the literature the term 'level of engagement' is often used but not clearly defined. As I was writing this study this term came up over and over again. I was using it to describe engagement among the participants, but there was no clear description of what the term 'level of engagement' involved. Woolfolk's (1998) motivational theory mentions the intensity of involvement in an activity, but does not provide a definition of level of engagement. But how is intensity of involvement defined? As I looked at the data and later on reflected on my practice I slowly realized that there

are two indicators that allowed me to sense what I perceive as level of engagement: the mood of the conversation and where is the conversation flowing from (from me or the teachers)? Looking at my data in this study and trying to find a way of dealing with it made me realize that in my lived experience as a professional developer I tried to be constantly aware of the mood of participants, and the flux of the conversation. This was a realization for me that I was not consciously aware of, although I was attending to it intuitively. I realized that I am usually wondering if the teachers are enjoying themselves, are they bored, exploring, resisting, afraid to participate, working together, cooperating, etc., and are they the drivers of the conversation, or am I the one who is pushing it forward? These two indicators, which I will refer to as mood and flux, usually provided me with signals/information as to how to proceed during the session. It was not clear at the beginning that this was the case, but the more I looked at my data I realized that this was what I was doing to find out the level of engagement. These two new constructs emerge out of my analysis as key indicators of engagement; there is nothing in the literature where I could find a reference to something similar to characterize level of engagement.

I was not able to find a consensus regarding mood definition. There are some articles, mainly by psychologists (Martin & Kern, 2010), which state that mood influences learning, but in general there seems to be an absence of this concept in educational literature. It is different than attitude because it reflects the state of the moment while attitude is a more permanent stance, usually connected to beliefs (Schwarz 1997; Martin & Kern 2010). Mood is usually "understood as a momentary, relatively long lasting, and subjectively experienced state of mind […] Mood can be described as a continuum ranging from a bad/negative to a good/positive" (Brand, 2012, p. 2328). In the literature I was not able to find any working references to mood or references about noticing who is carrying the flux of the conversation (or something similar). I theoretically incorporated them in my analysis because they became relevant tools in analyzing engagement as I tried to recognize when learning is happening through communication and cognition and when it is not.

Through engagement I have witnessed a variety of moods in moments of reflection, exploration, rejection, resistance, boredom, confusion, fear, rejection, doubt, fuelled by the teachers' motives and wants, which ultimately impacted their learning and

by realizing who is carrying the action and stream (flux) of communication during the activity, what I call the flux among participants during professional development sessions, I recognized different types or modes of engagement, some of which were conducive to learning and some which were not. If all the comments come from me, the professional developer, and the teachers are bored, resisting or afraid to provide any comments, this would indicate to me that I am not being successful in providing for a learning opportunity. On the other hand, I have seen how what I consider high levels of engagement are signalled by active communication among the teachers. If this combined with an explorative and supportive mood, it can provide prime conditions for what I call a point of inflection or a change towards optimal flow (Jackson & Csikzentmihalyi, 1999). So how do we put all these elements together? Initially I visualized my framework as follows:

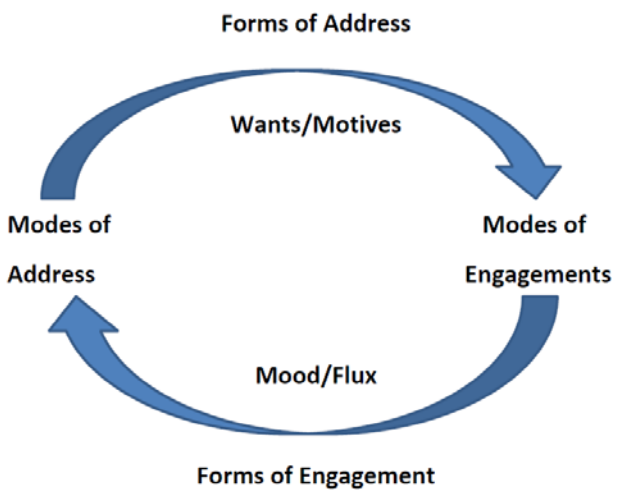


Figure 1: Diagram of initial model

This model describes a process where first I start with a mode of address, using a form of address which together with the motives and wants of the teachers will result in a particular mode of engagement which I will be able to perceive through their mood and noticing who is carrying the flux of the conversation together with a resulting form of engagement.

I used this visual representation for a long time and it was the tool that I used when I was producing the modified flow charts of the sessions (See appendix A). This visual

representation as I explained in Chapter 4 turned out to be not very useful as a form of analysis.

As the visual tool was modified from a circular model to a bow tie model, like the one bellow, I was able to see a clearer way to analyze my data.

Figure 2: Diagram of the model of the framework

The reason for this was that, if I started with a mode of address, using a particular form of address, this positioning or strategy was filtered not just by the motives and wants but also by the mood that was already present in the room. As I started to look at the model with this modification, a way to represent the phenomenology of professional development in a way that was succinct and useful for me as a tool for analysis started to materialize. Here is where I came up with the idea of scenarios for my analysis. I see a scenario as a unit of exchange, where the professional developer has a plan, and in accordance with it, s/he introduces or presents an idea or task. This action is taken in by the teachers, and the teachers then respond. Communication is not perfect, the original ideas passes through the teachers' 'wants-motives-mood' filter, so what the teachers take out of what the professional developer presents to them is not necessarily what the professional developer expects, given that the response the professional developer receives also passes through her/his 'wants-motives-mood' filter. The unit is completed when the professional developer takes in the response and sees a need to re-direct. The idea of scenario emerged form analyzing the data, as it became clear that we could divide a session in units of exchange which start every time there is a need to re-direct through a form of address. These units of exchange can be used for analysis as they provided a way to analyze the role of each element (MoA, FoA, MoE, FoE, Mood, flux, wants,

motives) within manageable amounts of data, that later on can be put together to get a full analysis of a session. The Scenario idea will be described in the following sections.

Scenarios

As I took another look at the data with the new visual model of the framework and the idea of Scenario as a unit of exchange, six possible basic scenarios emerged from my analysis. I was able to analyze the professional development process by taking a look at each component (MoA, FoA, MoE, FoE, moods, wants, motives and flux) and the part it played within this unit of exchange. In my experience, these six scenarios seem to cover most of what can take place during teachers' professional development.

What follows is a description, along with some illustrative examples, of these scenarios, together with some personal notes about the lived experience of these sessions. I will illustrate these scenarios with dialogues that took place among some of the teachers who attended the professional development sessions. These ranged over a number of subjects having to do with the teaching of elementary arithmetic. Let me give some background to help the readers follow them.

The characters in the dialogues (or Dramatis Personae, otherwise known as the cast) are Cosima, Jane, Mindy, Rebecca, Tania, Tom, Madeline, and Monica. Cosima and Jane are experienced Kindergarten teachers. Mindy is also a Kindergarten teacher, first year in her teaching. Rebecca, Tania and Tom, are all second grade teachers. Rebecca is a highly experienced while Tom and Tania were in their first year of teaching. Madeline is a Grade 5 teacher who has been teaching for over ten years and Monica is a Grade 4 teacher with over five years of teaching experience.

The resources for the teachers, often the subject of discussion in the examples, are the textbook, workbook, the teacher's guide, and some instructional videos, all of which contain a variety of activities to tackle mathematical concepts.

Some teaching methods I will be referring to relate to the part-whole model, and the comparison model. These are two of the three main models in the Model Method (the

other being change) in the Singapore Mathematics program, which are used in the teaching of arithmetic operations (addition, subtraction, etc.) and problem solving.

Scenario 1:

Figure 3: Scenario 1 diagram.

This type of scenario usually occurred when the professional developer came with a plan, put it in action, and the mode of engagement was such that the form of engagement turned out to be empty. That is, no apparent form of engagement was produced. There was simply no reaction. Either the teachers did not respond in any obvious way or their comments/answers added no additional information that would help the professional developer to follow up with a more suitable mode of address for them to actively engage. The teachers were not actively engaged and their mood can be one of confusion, boredom, resistance, passivity and/or fear; there was no conversational flux and it was difficult for the professional developer to figure out their motives or wants without some previous information that could be linked to this behaviour.

Example 1.1:

This is a general example that occurred with several of the groups I worked with, which fit Scenario 1.

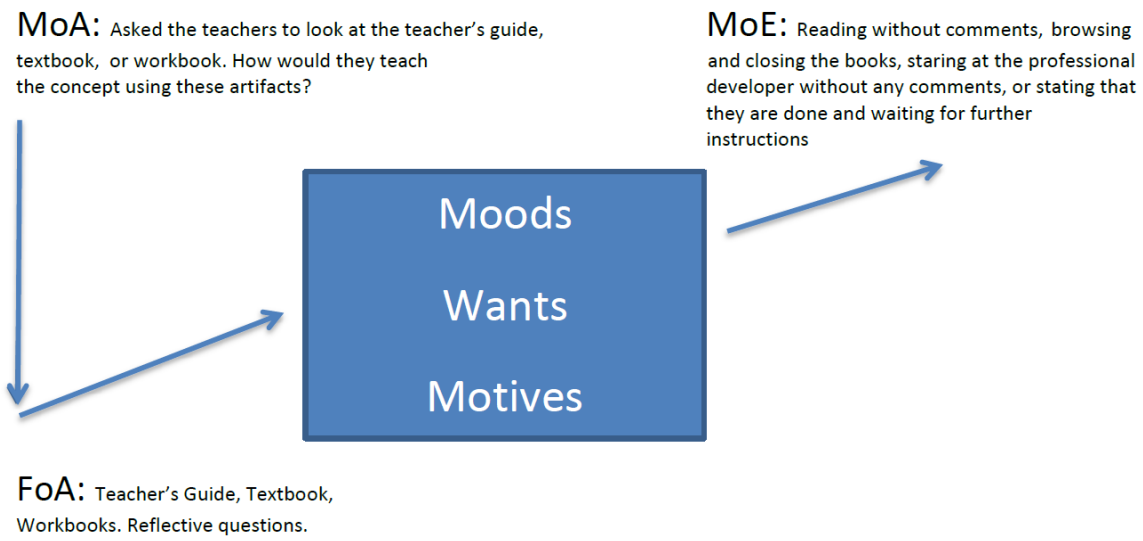


Figure 4: Example 1.1 diagram

As mentioned in Chapter 4, several of my initial sessions started by asking the group to explain how they would teach a particular mathematical concept, and to tell me about their practice. After what I hoped would be a rich discussion and exchange of ideas (which was not always the case), I provided the teachers with copies of the pages in the textbook and workbook, which dealt with the concepts that had previously been discussed, and afterwards I would introduce the teacher's guide.

I used this process with several different groups at the school, and it was very common that I would show a group the teacher's guide or the other main resources for the first time, and there would either be confusion, or they would browse the book, close it and look at me as if expecting something. In fact at this school, two Grade 2 teachers had been using the program's textbook for more than four years, and the Grade 5 teachers were also using the textbook and workbook for over a year, and none of them had ever seen the teacher's guide for this program. Yet, when I asked them how they used those resources, most of them were quiet and they did not engage with this question. In particular, when I gave teachers the teacher's guide to read I noticed that many of them just looked at the index, only stopping if they found something interesting and/or they paged through the material perhaps looking for something novel. Otherwise, they were done and waiting for my instructions.

Madeline, one of the Grade 5 teachers, was asked to read a section of the teacher's guide for discussion. She just browsed the content and within a minute she was looking at me waiting for what was next. She told me afterwards that she knew how to teach all these concepts already and she just wanted to see new or more enjoyable resources for her to use in class. This comment helped confirm the importance of helping teachers to see something that they think they already know with new eyes—something I will do later on with a different mode of address (see Chapter 6).

I experienced Scenario 1 with most groups when I introduced a section of the textbook, workbook or teacher's guide for the first time and I asked them about how they would use this material. For the most part, I encountered this type of scenario early on during the sessions, if it occurred. When I encountered little or no response, I tried to figure out the mood in the classroom. Confusion and/or resistance were the most typical moods I encountered in examples of Scenario 1. Interestingly enough, with some of the groups in this school, I did not sense any of these moods, but there was some level of neutrality, as if they were expecting me to take charge and do something else to move the discussion on. As I worked with several of the groups at the school, I found out after asking some questions, that the reason for this behaviour was they were used to professional development where the professional developer behaved more as an instructor than a coach, telling them what to do. I had to remind them that I expected them to actively engage with the materials and that we were all to discuss them together.

Scenario 2:

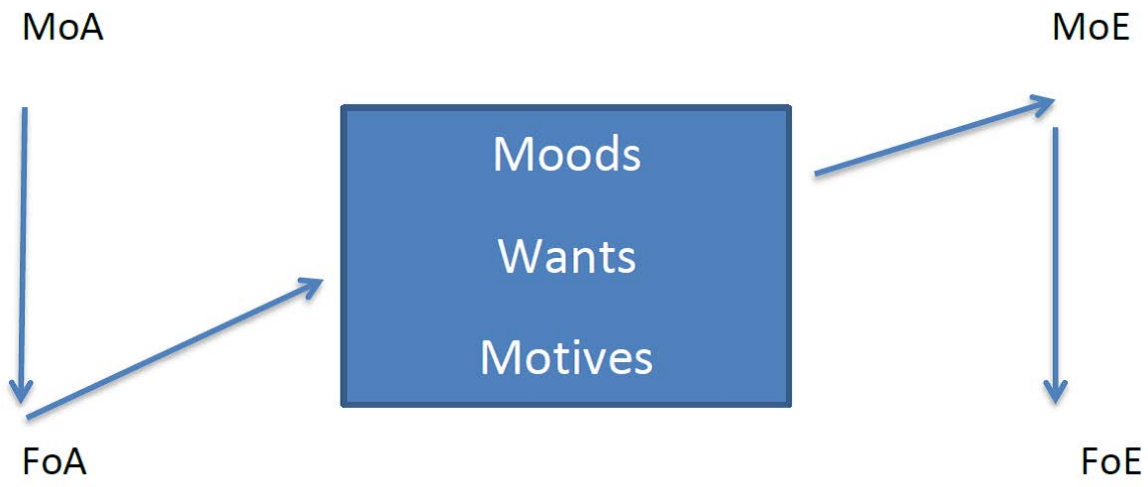


Figure 5: Scenario 2 diagram.

Scenario 2 involves what one might call a lateral movement, where a form of engagement is produced but what is being produced is an unexpected outcome, or a confusing response. Usually the professional developer will have to re-direct, further inquire or address what was produced. The form of engagement being produced is not useless; as a matter of fact, it can give us great insight into teachers' wants, preoccupations and mistaken assumptions, as we will see in the example below. In this scenario, the teachers produced statements but there was no conversational flux. Nevertheless, the form of engagement provides the professional developer with hints on how to proceed. The professional developer carries the flux of the conversation by redirecting or asking questions.

Example 2.1:

In this case I introduced the resources to all the kindergarten teachers for the first time under the impression that they had already been using some of them. Jane said she was confused about the resources. She had chosen a different textbook than the one I had suggested a few months ago. When I asked, "Why?", Jane said, "I looked at both of them and, in the book you suggested, I did not see any addition and subtraction or other number operations until much later in the year. The other book started them earlier". Her reason

for doing this was, "You see, I was worried that the parents would ask us, 'Where is the math?'" Cosima supported Jane on this.

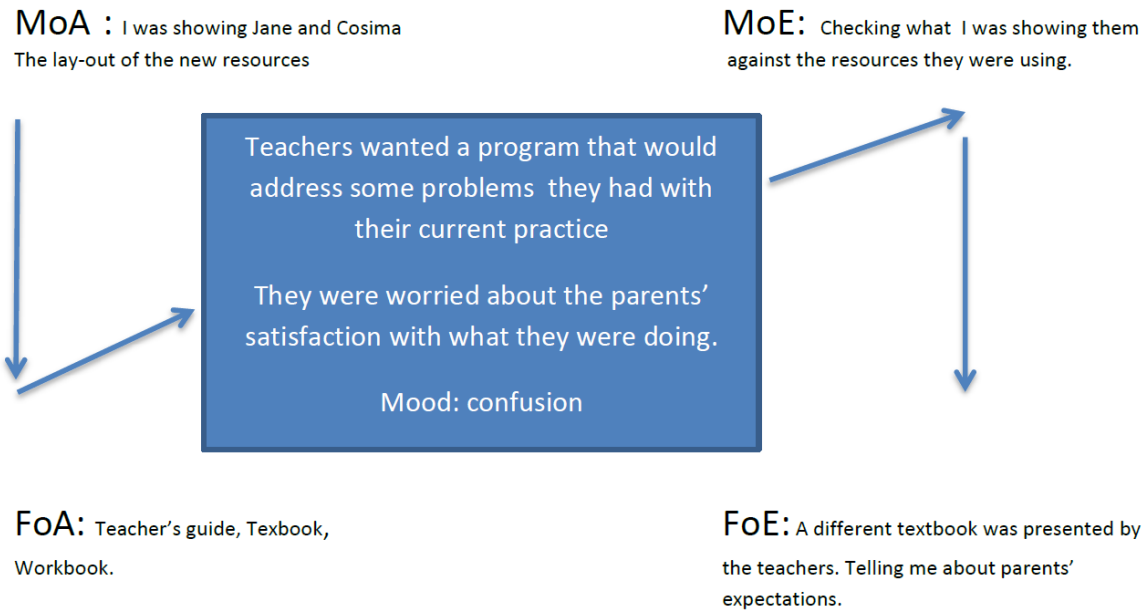


Figure 6: Example 2.1 diagram.

Jane and Cosima's preoccupation with parents' perceptions about the program was important. I needed to address this issue before we could continue. I was able to allay this preoccupation by explaining why this program first introduces many other concepts and vocabulary before getting into number operations. My explanation was satisfactory and, according to Jane and Cosima, it provided some feedback to some of the problems they had with their practice.

Here the mood was one of confusion and worry because of the different resources being brought up. The teachers were worried about the parents' possible displeasure by not seeing more numerical and number operational lessons. The important thing was for the professional developer to realize these preoccupations if participants were to move forward. The form of engagement being presented (the different textbook) was an important source of information as it provided me with an idea of the kind of materials Jan and Cosima thought parents would like, and that they, the teachers and parents, expected numbers to be the main object of math lessons.

What occurred during this scenario was completely unexpected, but I was able to redirect and move on, by making sure of taking care of their worries regarding the parents' expectations.

Example 2.2:

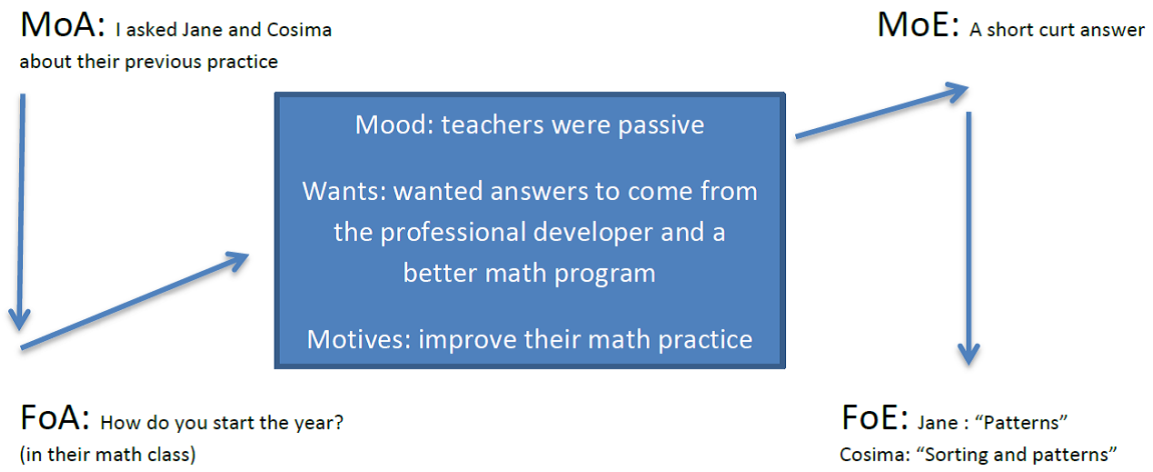


Figure 7: Example 2.2 diagram.

Here my form of address is a reflective question: "How do you start the year?"

This question was answered in many different ways by the groups and by the individual teachers in each group. It would usually encourage fervent discussions among the teachers, who took advantage of the opportunity to recall their own experiences and practices, and this gave everyone a chance to share and learn. Note that a reflective question is a question that invites reflection, perhaps even introspection, and not just a simple recall of past experience.

I usually find that many teachers are eager to answer this question, and it is usually a good way to start the first session. With the Grade 2 book, Rebecca gave us a good description of how she started, why and what she did afterwards. She really enjoyed telling us about how she planned her year.

However, reflective questions can also be answered the way Jane and Cosima did, which was with a very short response, or not at all. In this case, I was taken aback to get such a short answer from Jane, who loved to talk about her practice. But I soon recalled they were used to professional development in which the developer took on more

of a trainer role. I explained again that I was there as a facilitator and we were supposed to have discussions about their practice and the new resources. After this explanation, and with a little bit more prompting, Jane gave me a much more detailed answer.

In Scenarios 1 and 2 there is no conversational flux being carried by the teachers. However the difference between them is significant. In Scenario 1 there is hardly a clue as to how to proceed whereas in Scenario 2 there is a definite indicator: I was able to realize the teachers' mood (confusion) and preoccupations (parent approval of the program). In instances of the second scenario challenges may arise (such as providing suitable explanations shown in example 2.1), but these challenges can broaden the professional developer's practice if one is willing to learn from them.

So far in these two scenarios, not much has developed according to the professional developer's plan. This is not necessarily the case with the next scenario.

Scenario 3:

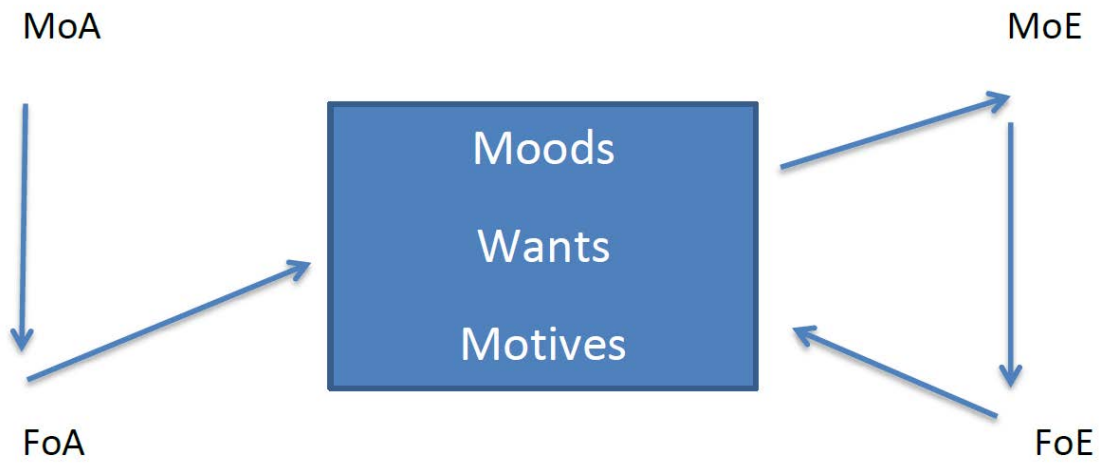


Figure 8: Scenario 3 diagram.

This graph implies that a form of engagement has been produced which indicates either a clear interest in or understanding of the professional developer's plans. The form of engagement being produced could be questions or comments that indicate interest in, or understanding of, the material the professional developer has introduced. However, the teachers are not yet able or willing to carry the flux of the discussion themselves.

Example 3.1:

With the Grade 2 group I gave more lectures than with any other group in the school. In this case I explained to the group two basic visual models for problem solving used by Singapore Mathematics: the comparison model, which uses at least two bars to compare numbers and to get their difference, and the part-whole model, where bar-parts are either added to get a whole bar, or subtracted from a whole bar.

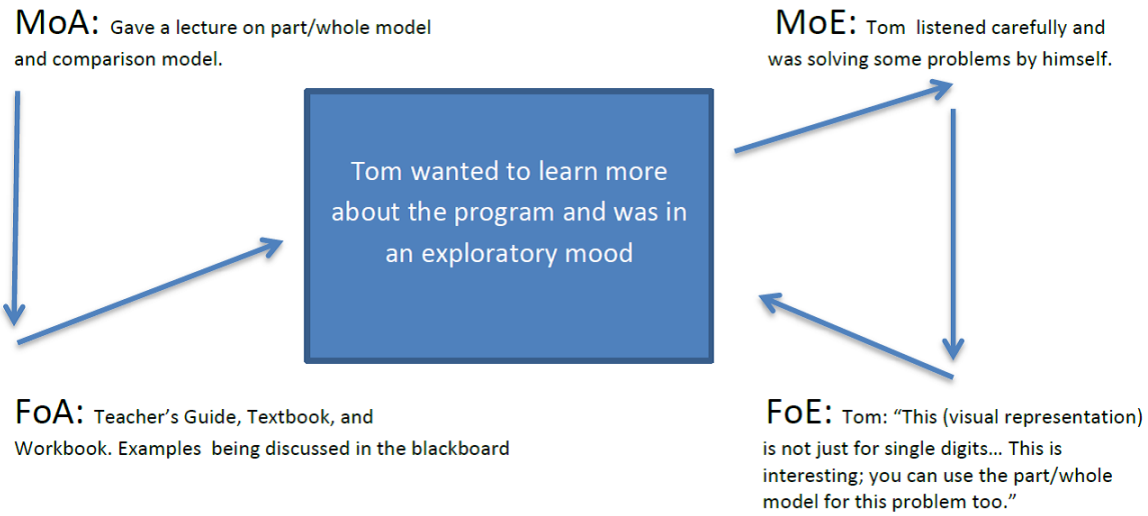


Figure 9: Example 3.1 diagram.

Tom's statements followed a lecture I gave the whole group. The interaction reminded me of an old-fashioned classroom where the trainer teaches a lesson and the participants provide answers to let the trainer know that they are following and understanding, but the control of the lecture lies with the trainer.

Tom made some interesting comments that showed that he understood the models. His motive was to learn more about the program. I was not sure about his wants but he seemed to be in an exploratory mood. Tom showed that he understood that with this visual representation we are able to expand further than with number families. He was also able to see that sometimes one can solve a problem using either the part-whole or the comparison model (however, he later found out this was not always the case). His comments made me realize that he understood what I explained and that he was able to make conclusions on his own about the visual devices used by the program. However, this was not enough for him to carry the flux of the discussions, either with the other

teachers or with me. I sensed that the reason for Tom not displaying a more active engagement was Rebecca's mood. She was not happy about how the implementation of the program at the school was going to happen and she showed this resistance during the sessions by making comments to let us know that she was not happy. Tom deferred to Rebecca as the leader of the group. For him to interact the way he did in this instance showed me that he was really interested in what I was showing him and that he understood. However, I sensed he did not feel comfortable going further by carrying the flux of the conversation.

Tom's statements followed a lecture I gave the group. The interaction reminded me of an old-fashioned classroom where the trainer teaches a lesson and the participants provide answers to let the trainer know they are following and understanding, but the control of the lecture lies with the trainer

This scenario was a common occurrence in Grade two. Tom and Tania (the other member of the team) showed they understood what I explained (I mainly lectured for this group) by responding to questions. They showed their interest by making some comments where they let me know what they thought about some of the lessons being discussed. Only once or twice did they seem to feel comfortable in initiating a discussion among themselves or with me. Rebecca often made comments about how the ways she had been doing things were better, and this had an impact in their participation. This leads to the next diagram, which is similar to the one above, but here the teachers carry the flux of the conversation.

Scenario 4:

In this diagram the facilitator starts the conversation but then the teachers mainly carry the flux of the conversation for the rest of the activity. The professional developer is a non-participant in the discussion, except perhaps for a few guiding comments (This is indicated by the dotted arrow).

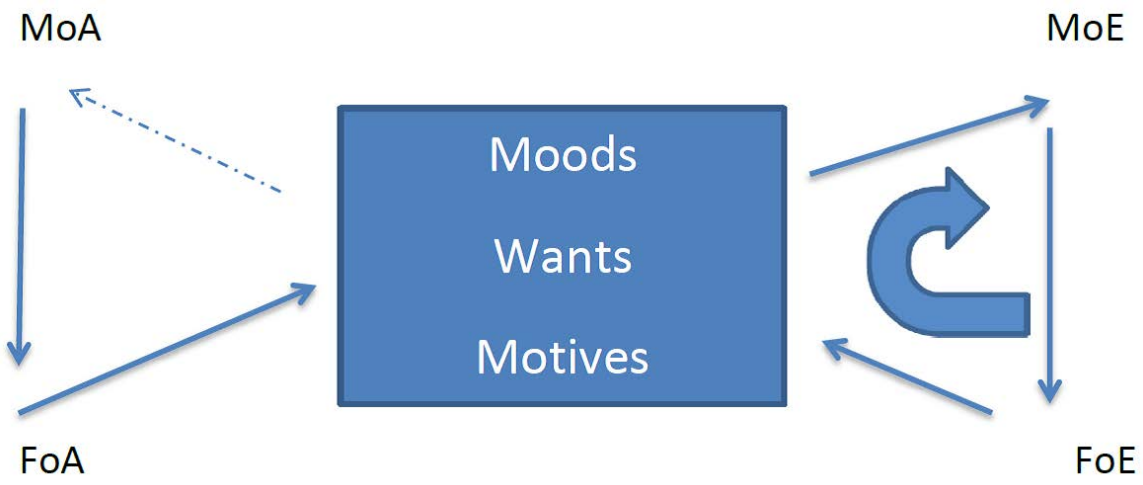


Figure 10: Scenario 4 diagram.

Example 4.1:

Jane and Cosima wanted to create report card guidelines. After looking at the teacher's guide and realizing the number of chapters they had to deal with, they did not know where to start. I suggested they should look at the assessment pages at the end of each unit and the lesson objectives as well. From there they "took off". The goal of the motive and the want, in this instance, were the same. Jane and Cosima's motive to attend this session was to develop report card guidelines for their practice and they wanted to use the session to produce report card guidelines.

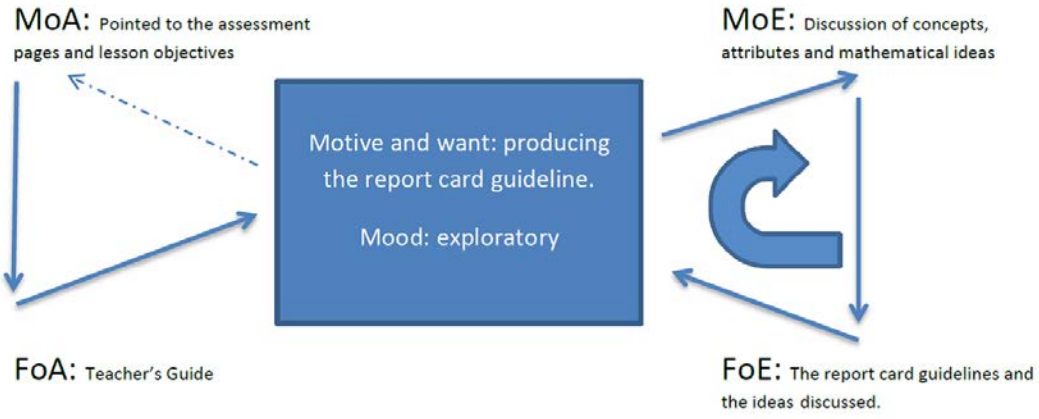


Figure 11: Example 4.1 diagram.

Jane and Cosima discussed a variety of mathematical concepts in order create meaningful report cards. After they got started I was mainly ignored. They carried the flux

of the conversation on their own. As is evident in the following conversation excerpt between Jane and Cosima, their students would be evaluated on their understanding of a fixed number of concepts and their understanding would be rated on each concept. “Meeting criteria” has its degrees: it can be full, minimal, or non-existent. The final mark would be decided by adding the quality of their understanding, according to how the students met those expectations for each concept. In this discussion, the teachers tried to identify the relevant concepts, their order of presentation, and they also tried to understand just what ‘understanding’ meant. In this first part of their conversation they were discussing attributes and devising a plan on how to measure students’ understanding of these concepts and setting a scale for assessment (expectations).

> Cosima: No, that is not the first one! The first one would be back here in matching and sorting. Students match and sort objects according to attributes.
>
> Jane: The great thing about that statement is that we can specify.
>
> Cosima: If they can only do colour, [it] is minimal, if they can do colour and pattern they are meeting, and if they can do colour, pattern, and function (how an object is used) they are fully meeting. This is great! The second one is objects-to-five. I almost do objects-to-ten, because we only have six statements. Then five can be minimally meeting.
>
> Jane: I agree, because objects-to-ten is the next unit, and then minimally meeting should be less than five, meeting five, and fully meeting ten.

They took some time to look at the materials, and later on, the following discussion ensued, which was not just about how to measure students’ understanding but also included a very nice exchange about learning two-dimensional shapes by using three-dimensional objects.

> Cosima: Now we are on shapes.
>
> Jane: I have my big questions about two and three dimensions. I really don’t believe in doing two-dimensional shapes first. Two-dimensional shapes are a concept, three dimensional shapes are concrete. I was always taught to teach three-dimensional shapes first. It's not that they cannot know circles, but what they need to know, it is that a circle, as soon as you draw a circle on the board it is not a circle anymore is a cylinder, because it has the width of the pen. I know I have been really picky...for the children to understand...[that] there is a circle at the end of the cylinder.

Cosima: Which is actually what they have done here.

Jane: Yes! Oh my...

Cosima: Which is weird they are identifying circles even though they are doing three-D. They do two-D in the three-D.

An incredibly animated exchange followed with a closer look at the teacher's guide and the textbook. The requirement for the 2-D shapes was first to identify and describe the two-dimensional shapes: circles, rectangles, squares and triangles, then to identify different shapes that make the faces of solids. Teaching 2-D shapes using 3-D solids was an "Aha!" moment for Jane and Cosima.

The mood was explorative, cooperative and supportive. They were interested in what was happening and they wanted to learn more on their own. This desire was shown by the way they looked through the teacher's manual for ideas; how they discussed the assessment; and how the carefully looked at the mathematical concepts being presented. They were supportive and cooperative in their conversation. They worked together to obtain the report card guideline they wanted, but they also explored new ideas on how to teach mathematical concepts.

With the other groups of teachers I encountered similar discussions when they realized the teacher's manual had many ideas that would enrich their practice. They really needed to see how useful the manual could be in their teaching. This realization triggered an exploratory mood in many of them. The more supportive they were of each other the more they were able to have good discussions and learn from each other.

As is demonstrated in the above example, Jane had looked at the manual, but not that carefully. It was Cosima, whose deeper examination of the material and pointing out something that was relevant to what Jane was saying that triggered a good conversation about the lesson. Jane and Cosima worked well together and were supportive of each other's learning as they further explored the materials.

It is clear that in this scenario the teachers are learning on their own. They are reading, reflecting, sharing and learning. Although, learning happens in both Scenario 3 and 4, there is a difference in the quality of what is learned in the two scenarios. In scenario 4, who is carrying the flux of the conversation is the element that makes the difference.

Here the teachers are actively engaged by talking to each other and exploring what is being presented to them. They are the ones who are asking questions and mostly answering those questions themselves, which was not the case with the previous scenarios. In scenario 4, in contrast with scenario 3, the exploratory and supportive mood and the flux are two indicators of more effective activity and learning.

In the following scenario both sides propel the conversation (flux), which brings about an interesting discussion.

Scenario 5:

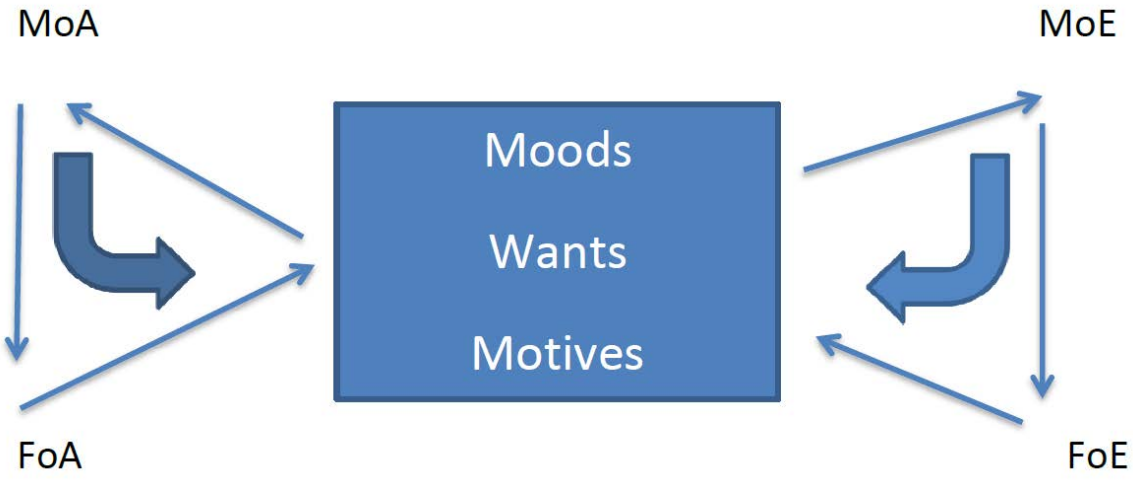


Figure 12: Scenario 5 diagram.

In this graph, there is a back-and-forth of ideas, where the flux of the conversation flows from professional developer to teachers and from teachers to the professional developer. The graph depicts a discussion between two groups or participants. In this case there is a separation, between the professional developer and the teachers.

Example 5.1:

The following discussion exemplifies Scenario 5. Here the facilitator and an experienced teacher discuss a particular mathematical idea. The flux of the conversation went back-and-forth between myself and the teachers. Here the teachers were not just stating a premise or showing they are confused, they were actively participating in the conversation,

and having a discussion. The lesson that brought up this discussion was about teaching multiplication:

Facilitator: So here they have two children per spaceship. How many children are there in four spaceships?

Rebecca: I just do it the other way around.

Facilitator: Tell me about it.

Rebecca: I don't do two groups of four, (referring to the way it was stated in the textbook). I say four groups of two.

Tania: The way you write it is 4 groups of 2? (to Rebecca)

Facilitator: OK, let's talk about this 2+2+2+2 = 2 X 4. First, my unit and then the number of parts. In your case you write the number of parts first and then the unit. Is there a convention about this? No. You have to know what the numbers mean.

Rebecca: I don't know where I ever picked it up. That has always been my way of doing it and Trevor Calkins agrees. You first state how many times you are going to print the number, and then you state the number. They get that visual from Grade 1.

Facilitator: And that is OK. You can explain it that way and that is not a problem. You can say 'that this is the way you do it, but this is not the way it is done by everyone.' The textbook is an example.

Rebecca: Can you explain to me the rationale for doing it the other way? Here your unit is 2, times the number of groups.

Tom: Even the reading we did two weeks ago (Aharoni's book) did it Rebecca's way.

Facilitator: I know. If you want to do it that way it's fine. However the kids should be aware that other people do it in a different way. Perhaps you should not tell them this when you are just starting to teach multiplication, but later on.

Tania: Rebecca, so you say you have to do it always one way?

Rebecca didn't answer.

Facilitator: No, just specify what the number means, and if the kids give you a good explanation, tell them that that is correct too.

Tania: Which number indicates the unit and which number indicates the group?

Rebecca and Tom were talking in the background, Rebecca stating that this would be confusing for the children.

Rebecca: Mentally visualizing what this means doesn't make any sense to me.

Facilitator: I agree that there are some easier ways to visualize some problems, but in this case there is no convention.

Rebecca: For me this has to do with the language and the way we phrase it.

Here Rebecca was leading the conversation as a knowledgeable participant. She was confident in her knowledge and wanted to let me know that she did not agree with my remarks and the resources of the math program. She was in a confidently-resisting mood. Tania's, Tom's and my comments showed some confusion, though Tom was also supporting Rebecca with his comment where he used Aharoni's book to support Rebecca's arguments. The flux of the conversation went back and forth between my arguments and Rebecca's counter arguments. The general mood was not supportive but argumentative, each one of us taking a stand, and in this case not coming up with a consensus.

I was at first puzzled by the rigidity behind Rebecca's statements, and later on I realised that I also missed the opportunity to discuss the idea of units, in particular having a number as a unit, not just centimetres, kilometres, etc. This example was also linked to the idea of commutativity. Mathematicians usually do not care which comes first the number of group or the number in the group. The reason mathematicians are casual is that we know that the order does not matter, that we get the result both ways. But, when students are just starting to learn about multiplication, they do not know this. So perhaps being prescriptive gets the students through the difficult first step. Then, later, they will learn it does not matter, and hopefully they will not have too much to unlearn. Perhaps Rebecca's rigidity came from the fact that she was teaching second grade, which must be the first time the students do problem solving with multiplication. If she taught fourth grade, perhaps she would have been less restrictive. Rebecca and I did not end up agreeing. I had a sense that I failed by not being able to provide better explanations. Rebecca's ideas were new to me. Rebecca's arguments were interesting forms of engagement. These were usually ideas teachers strongly ascribed to and professional developers should look at them carefully. There is much to learn about how teachers think something works from conversations like the one above: What forms of engagement are produced? How strongly did teachers feel about them? How did they defend these ideas (their mood), and how

should the professional developer re-direct (MoA) to have a meaningful and not confrontational conversation? It is important to note that this is what researchers might miss when they only analyze professional development outcomes with surveys or performance assessments.

During professional development sessions there often seems to be a divide between the professional developer and the teacher. This is represented in scenarios 1 to 5 by positioning the professional developer and the teachers on different sides of the bow. I find that with time that divide may decrease, but even though I have become good friends with many teachers with whom I have worked with, once a professional development session starts, I find the divide is still there. However there are instances where discussions bring us together and everybody contributes on equal footing. This symmetric contribution is what the next scenario's diagram models.

Scenario 6:

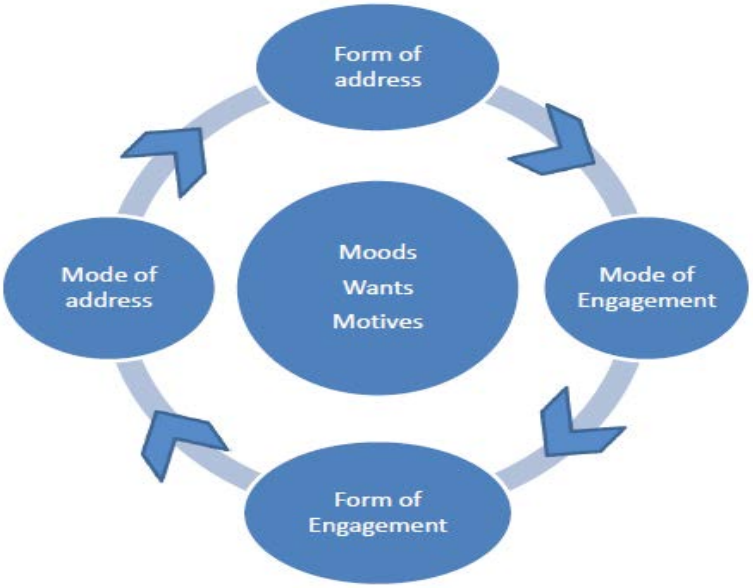


Figure 13: Scenario 6 diagram.

Here the professional developer and the teachers are all in one group having a discussion. Nobody has a position of power or a deferential position. Positioning by the professional developer is no longer needed as everyone is engaged and is able to promote/trigger the conversation. Anyone participating in the session can trigger the form of address that will

propel active engagement to continue. Resulting forms of engagement can become or are used as forms of address. Moods, motives and wants do not filter the interaction among the participants.

This scenario was the least common in my sample. In my experience, one needs time to get a level of comfort amongst the participants for this scenario to occur. I find this scenario also occurred most often when the teachers felt more comfortable in their mathematical knowledge and practice. Sometimes this scenario evolves from Scenarios 4 and/or 5 as in Examples 6.1 and 6.2, or Scenario 6 can manifest on its own as in Example 6.3.

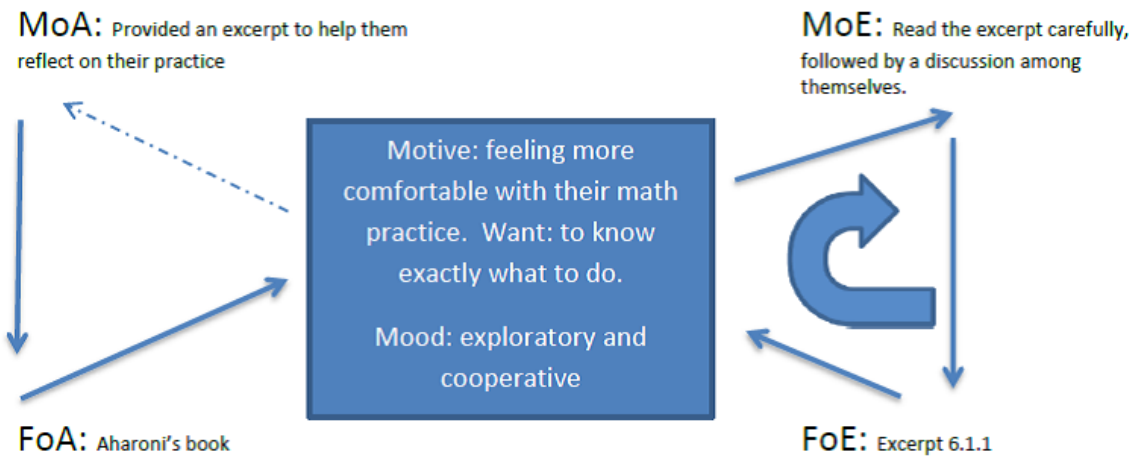
In this scenario the forms of address are usually compose from resulting forms of engagement and modes of engagement trigger modes of address. Ideas emerged, discussions followed, and then more ideas emerged. In this Scenario the MoA became the thought (further action) in the mind of who is speaking and the FoA was the statement of that thought. The MoE and FoE were reactions to this, which can at the same time become MoA and FoA. The teachers and the professional developer were contributing ideas, and were part of the discussion without a sense of separation or divide between two 'sides' as in previous scenarios. The flux was carried by the ones who provided observations and/or asked questions, which could be anyone (the facilitator or the teachers). Everyone was on equal footing and everyone could equally contribute to the discussion. A cycle was produced, as the one showed above, and this cycle usually stopped when a discussion about a topic had run its course, or when time ran out.

Example 6.1:

I gave Jane and Cosima an excerpt from pages 19 to 22 of Aharoni's book, Arithmetic for Parents to read, and told them I was hoping to have a discussion about it afterwards. This reading was "An Example of the Importance of Not Skipping Stages." I was hoping this reading would give them an insight into Unit 11, the next unit in the program. Unit 11 is about comparing numbers and making use of the terms 'more' and 'less'. In this reading, Aharoni explains that he tried to teach students the term 'more than'. He started with '4 more than' and was surprised to see that the students were confused. In a nutshell, he discovered he was asking to do two steps at once, for 'more than' is one step, and 'how

much' is another, different step. He found that he needed to do one step at a time, so he started with 'equal' and then 'one more', and then 'one more than', and then 'one more than that'.

They took about fifteen minutes to read the excerpt. In the following conversation Cosima and Jane carried the flow of the conversation. They were comfortable and enjoyed the discussion. The first lines of the following transcript depict an example of Scenario 4.



Excerpt: 6.1.1

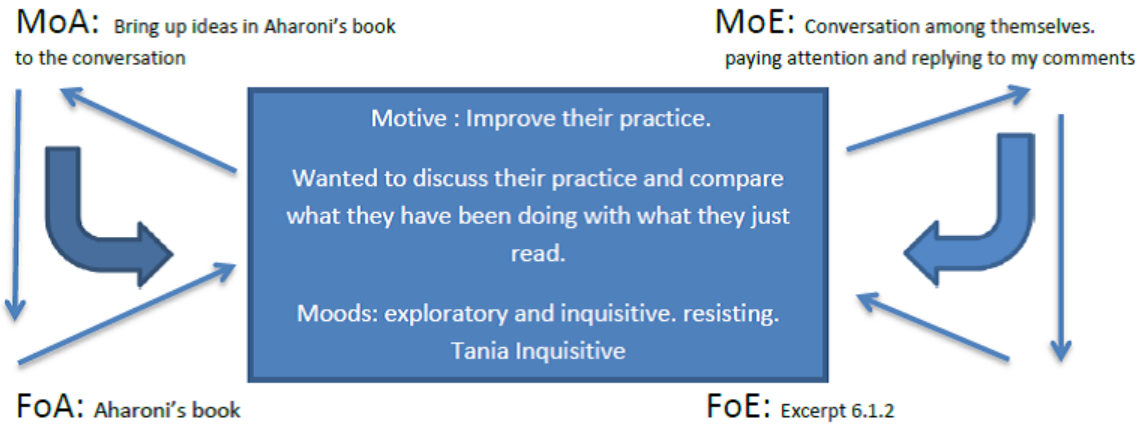
Jane: It is brilliant!

Cosima: This book tells you exactly what to do. I had a general feeling, but these books tell you what to do, always related to language, step by step and doing it slowly.

Jane: (looking at the teacher's guide) More-or-less-than comes before addition in this book. That makes sense. My children understand one-less-than, but, suddenly, then they need to compare, we ask them questions like Six is how many more than four? and they are lost. We jump all over the place! I have a child who had so much difficulty with this that she decided she could not do math.

Jane then told us about her difficulties with teaching some of the concepts that she had read about in Aharoni's book, and how she and Cosima had dealt with them in the past, and how the new program could help.

As they talked, I inserted myself into the conversation in order to contribute a few ideas, and we had a good discussion, but still it was a back-and-forth conversation between two sides: teachers and facilitator (Scenario 5).



Excerpt 6.1.2:

Jane: These pages are not in the books we are using. Now I can see they go too fast, and skips steps. (By 'these pages' Jane refers to a wide range of ideas that should precede the introduction of arithmetic equations, which are not included in the book they are currently using.)

Cosima: This is the problem with the books we bought.

Cosima: I think that using the smart board will be good to use with this program. When you have something that explains things so well, it would be wonderful for them to be able to see it.

Jane: You do three apples and one apple, and they can physically see me adding 'one more' on the smart board.

Jane: It is natural for them to struggle with 'one less'.

Cosima: Yes because addition is easier than subtraction.

Facilitator: You can make up number stories to help them understand subtraction.

Jane: We do that a lot.

Cosima: We, too, tell a lot of number stories.

Up to this point, the teachers were in Scenario 5. Then I made the following comment, which changed the mood of the discussion:

Facilitator: Yes, but let's see how many different words they can come up with to get rid of something.

An animated conversation amongst the three of us then followed, about the words you can use for subtraction like pop, ate, smash, destroyed, etc. We came up with crazy examples and were all laughing and having a good time. My position in the discussion changed from a facilitator to someone who just wanted to explore a variety of possibilities, together with Jane and Cosima. We were now in Scenario 6.

For the first part of the conversation, Jane and Cosima were in an exploratory and supportive mood. They were conjecturing about what they had just read and on several of the ideas that we had worked on before regarding the books they bought because they dealt with numbers earlier than the books in the program and the difficulties they had with subtraction. When I mentioned they could make up stories, they immediately stated they did that a lot. They were reflecting and figuring out how what they just read could help them with their practice. However, when I asked them to use different words that could

indicate subtraction, the mood of the conversation became exploratory and supportive, even playful, but still a meaningful learning experience. Jane and Cosima realized children could also have fun making up stories with all sort of words that could indicate subtraction, and that this was a worthwhile activity to introduce in class.

> Jane: Also to use as many words as possible for subtraction would be fun for kids and how they can use them when things go or not go away. This popped, this broke down.

By the end of this activity Jane and Cosima were still in an exploring, supportive and reflective mood, but they added a playfulness that allowed them to include some joy in what they were doing. Having fun can also be part of a meaningful learning experience.

Jane tried the lesson within a few days and here are her comments:

> Jane: I don't even have to use the word 'subtraction' or 'take away' to start with. We can use 'pop', we can use 'fell asleep'. I had my children yesterday because we were doing subtraction. I had five children up there and I said five children were playing in the park and two of them have to come home and then physically went away. And then I said anyone else would like to make up a story, so we have the five children and three of them went to sleep, and then somebody else ran away. So it was good using all these words, flew away. I can think of lots and lots of examples where they can physically see things going away.

Example 6.2:

Monica, a Grade 4 teacher, had thoroughly read the teacher's guide before the professional development session started, and was following the program as the developers envisioned it. She was the only one in the whole school who was doing this before I came. During the sessions with her group, she supported me in emphasizing the importance of reading the teacher's guide carefully. When other teachers in her group asked me how to use the workbooks, she said to them: "Didn't you read the teacher's guide?" or "Look at the bottom of page 95, there is a red arrow that tells you 'go to workbook exercise 46" or "It is not hard to figure it out". Her comments compelled other teachers in the group to be more careful with the readings I assigned during the sessions.

She was very enthusiastic about the program and she was one of the main advocates for its implementation at the school. Her support helped raise the level of mathematical discussions.

I asked each person in Monica's group to produce a lesson. Monica created one on problem solving with fractions as a solution. She created a worksheet with several problems and gave it to all of us, asking us for two or three different ways of solving each problem. She used a template similar to the one I had used for my first general presentation. She completely understood the idea of the importance of problem solving as the centerpiece of this program, and frankly, she knew as much about the program as I did. We all solved problems together. Some were easy and some were more difficult. But we all worked and discussed the solutions together.

When Monica started the session there were some teachers in the group who were afraid to participate. Monica had included some easy problems that we all solved together. We took plenty of time to discuss several solutions of those problems. I mentioned the importance of asking questions to get a better idea of the intricacies and complexities of the problems, and that asking good questions is as important as finding a solution. Monica and I solved two problems that were more complicated, than the first ones and she encouraged her peers to ask questions about the solutions, which they did. We had really good discussions, not just about problem solving, but the concepts involved in the problems. Afterwards, all the teachers in the groups worked on solving the rest of the problems and some of them surprised themselves, for they were able to solve some problems that initially they were afraid to tackle. Their initial fear changed to a cautious risk taking, and moved on towards feeling comfortable in taking risks and, asking questions. Everyone was involved in exploring, asking questions and coming up with different ideas to solve the problems at hand. Everyone contributed to the flux of the conversation, and the mood was explorative, friendly, and supportive.

Example 6.3:

Mindy had just described the lesson she had prepared for our discussion.

> Mindy: So I got lesson 15.5. It introduced subtraction. I had them look at the picture and talk about it first. Just looking at the shapes of balloons, just talking about that kind of thing,

> talking about the language and using examples of the books and then using manipulatives. I had the students work in partners and do their own math sentences.

This statement alone was not enough to provoke a discussion. However Jane and Cosima took a closer look at the teacher's guide and then started a discussion about Mindy's lesson and the next three lessons. They thought there was a sudden jump in the pace, which disturbed them because of the many times I had stated the importance of slowing down. In the end we found out it was not really a big jump, but that the lesson expectations were not what they thought.

> Cosima: Are they calculating, understanding and manipulating at the same time?
>
> Jane: Oh, the objective here is just to understand the process.

They realized they needed to look at the whole program more carefully. We started to discuss the resources. Jane took my copy of textbook A.

I started to discuss with them the part-whole model for adding and subtracting, and how to use a bar as visual representation of the parts and the total. The lesson Jane and Cosima were looking for ways to use this model to teach students the process of addition and subtraction. We went back to the lesson in which Jane and Cosima thought there had been a big unexplained jump: the lesson suddenly began using numbers which summed to more than ten, even though the students had not yet learned to add and subtract numbers greater than ten.

> Jane: What my students are doing is interesting, because in the other books it's different. They have numbers to 20 and then they are not colouring or counting, just getting to the number. If the number was two plus six say, what they would do is they [would] colour two and then they [would] colour up to six. So that is the mistake they are making, and it was in addition. So I had to say, 'No, you count two and then you count on six more,' and what I gathered from that, because it's my low ones, is that they don't have enough practical work. So, it is not making six, you are adding on six.
>
> Cosima: So now I see in section fourteen and fifteen, it's just about the process, and practicing the process in order to understand adding and subtracting by counting and putting together or taking apart. They don't need to show that they know their number facts.

Facilitator: They are not memorizing, they are doing it by putting together or taking apart through counting. It is only in the next section, section 16 that they start to develop addition and subtraction facts with larger numbers.

Cosima: Very good! All this detail I never thought about before.

Jane: I guess this is about making kids feel comfortable with the process, and not making a big deal about using big numbers.

Cosima: You have to make a big deal. Just don't make it scary!

Jane: What I like about what we are doing in these discussions is that they make me realize all the things I take for granted they know .

Cosima: Or that you think they can handle.

Then we discussed other resources like the fairy tale books, which are part of the program and connect some mathematical ideas with language and literacy.

When Mindy finished her presentation, I was going to move on to something else. It was Jane and Cosima who really started this discussion. We had been working for an hour and Jane and Cosima had presented the lessons I asked them to prepare. Jane and Cosima had already become familiar with many sections of the materials, and they were critically taking it all in, exploring and reflecting. They felt more comfortable with the materials. The flux went from passive listening to me to actively questioning and discussing. The mood was explorative, but they were also excited when they realized the reason for the alleged jump, given that they could see why they had some difficulties in their practice and how the lesson in the manual described a way to deal with them.

Observations

The visual representation of the six scenarios provided me with a way to deal with many of the elements that compose the live-experience of professional development. The comments below summarize several major factors of the lived-experience method of analysis that I developed.

The first three scenarios can happen almost instantly as a facilitator starts working with a group for the first time. This instantaneity is not the case with the last three

scenarios. There has to be a level of confidence, trust and/or knowledge for these scenarios to happen.

Mood and wants are important factors that affect the predisposition towards learning. Mood is very much influenced by the confidence teachers have in their knowledge, but it is also influenced by working with someone unfamiliar. Also the mood changes as the lived-experience of professional development unfolds. In Example 6.3 Jane and Cosima went from confusion and questioning the facilitator to actively exploring and being curious about the lesson Mindy presented to them. However, the moods, motives and wants are not always clear during the interaction. Sometimes one cannot determine them until the scenario has run its course. Examples 2.1, and 2.2 are instances of this. In Example 2.1 at the beginning I did not realized that Jane and Cosima were confused. It was not until Jane brought to me the textbook which was different from the one I was using to explain how the new program worked, that I realized what the problem was. In Example 2.2, Jane's and Cosima's answers were confusing to me. I did not realize that their expectation was for me to tell them what to do next. Here is where the professional developer's experience comes into play to inform how to proceed based on the information that s/he perceives coming from the teacher's mode and form engagement.

As I was identifying the possible basic scenarios I realized that what I was focusing on was the form of engagement. It was the key source of information to help me figure out what had been accomplished during an interaction. Forms of engagement became key sources of information. They allowed me to find out if the teachers understood what we were discussing (example 3.1), and how they would use the new program (example 4.1), etc. I will discuss this emerging theme in the next chapter.

Overall, I have identified six different types of scenario. Each type can be part of a learning activity or task. As each scenario runs its course, the professional developer should use what was learned from what took place in this interaction to answer the following questions: Has the goal for this task been accomplished? How should s/he guide the process through a mode and form of address in order to arrive at the desired goal? The forms of engagement being produced, the mood of the conversation and who is

carrying the flux of the conversation are important elements that had helped me evaluate whether I should continue with what I was doing, or if I should redirect.

In the next section I will discuss how to use the scenarios to analyze my practice. I will demonstrate how the ‘clues’ from the scenario can be used to alter professional development interactions, making them more useful.

Analyzing an Activity:

I always prepare a variety of activities for each professional development session I deliver. For each activity I plan an initial course of action (MoA) with corresponding forms of address which I think are best suited for the task, but as shown in my previous examples, I am not always successful in attaining the goal I had set for the activity the first time I try. Sometimes, I needed to redirect or make modifications that would depend on the teachers’ mode and form of engagement. After each professional development session, when I reflected on what happened, I found it particularly useful to analyze the actual path of the actions that took place during the session. In order to do this, I realized that I could use my framework by analyzing the activity as a series of scenarios, where after each scenario, as the professional developer, I tried to figure out what I learned. I tried to figure out the mood, the wants, the motives and the forms of engagement that were produced, as well as the actual knowledge gained in order to proceed.

This is the totality of the model: the professional developer can analyze an activity by dividing it into the scenarios and figuring out at each stage what was learned in order to proceed. The following diagram indicates how to use the scenarios to analyze a generic learning activity. This diagram shows an activity that can be divided into three scenarios. After each scenario, the professional developer has learned something that will allow her to proceed (this knowledge is presented in the quadrilateral with the round corners between scenarios). The following diagram is a visual representation of a typical activity, depicted as a sequence of scenarios. The example that follows was taken from an actual discussion between Jane, Cosima and I. This discussion does not include any of the previous examples.

Each stage of the following diagrams displays the following form:

(1) Scenario diagram:

(a) The dialogue is mostly contained as part of the diagram, in the MoA, FoA, MoE and FoE, but

(b) when it is too long, it is presented as an excerpt.

(2) Below the scenario diagram, there is a shaded box with round corners that gives the PD's brief assessment of the state of the scenario along with the PD's strategy for the next stage.

(3) Sometimes a paragraph of text, giving the PD's insights might follow.

(4) Repeat (1)-(3) for the next stage.

(5) The final round-cornered what-was-learned box contains the PD's assessment of the whole task.

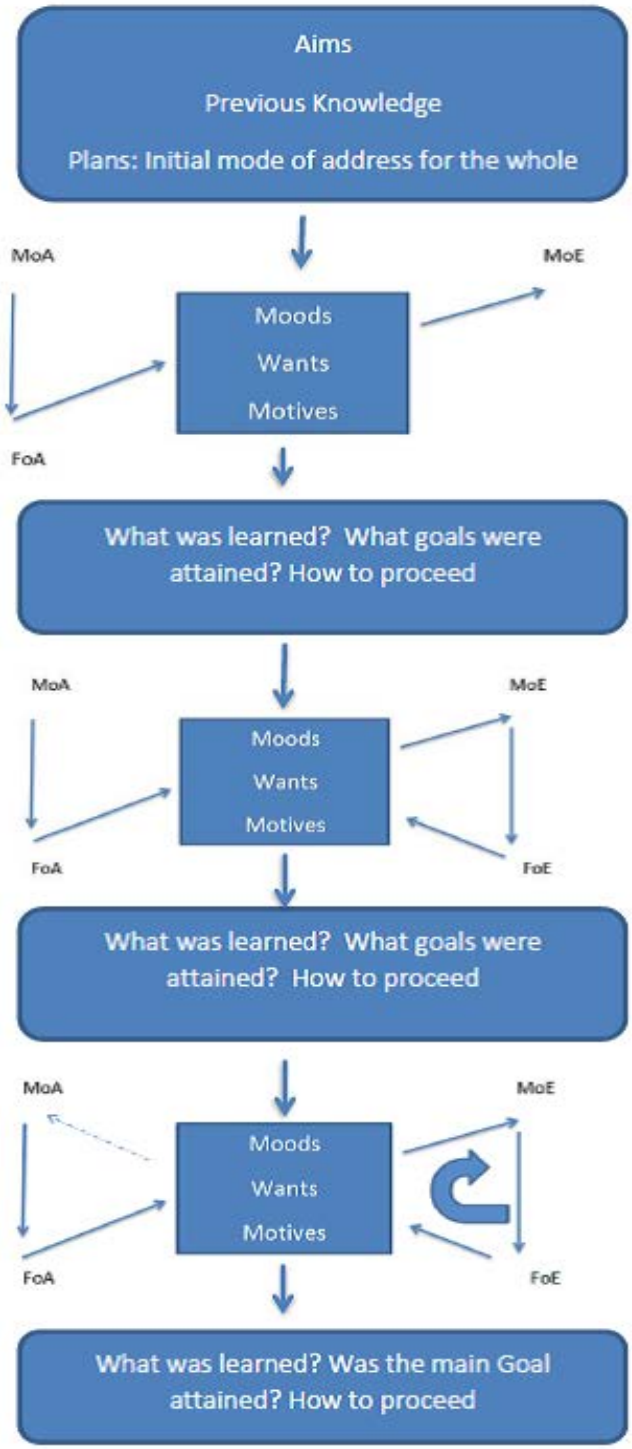


Figure 14: Learning task diagram (LT.1)

What follows is an example from my data and how the framework can be used to study it.

Inside Professional Development

Example Lt.1 represents the in-the-moment activity inside the professional development sessions and the steps I took as the professional developer to position the teachers towards a fruitful session. It shows the modes of address and forms of address I used, what were the resulting modes and forms of engagement, what I thought at the time it was happening and what should be the way to proceed. It presents the phenomenon as it occurred.

Example LT.1:

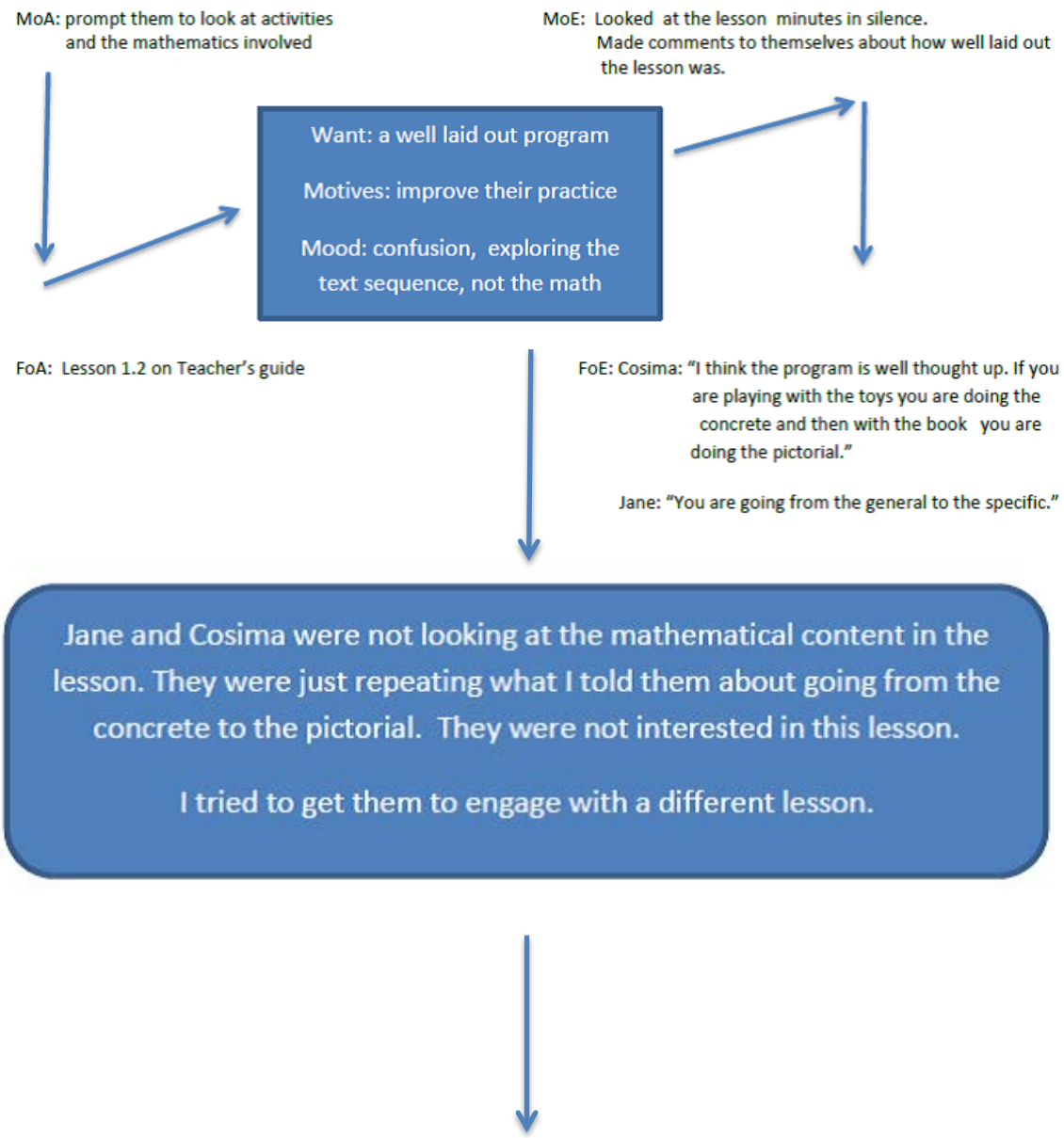
Before this task, Jane, Cosima and I had discussed the program and laid out the resources. I had then asked them to take a look at the mathematical content of the lessons in the teacher's guide. This did not work out as they would inevitably ask again about the layout, or the use of specific resources such as the text and activity book. Then they would sidetrack the conversation by discussing their previous practice. Before starting the next learning task, I tried to show them a previous lesson and to start a discussion about its mathematical content, with little success. What follows is my second attempt at getting them to look at the mathematics content in the resources.

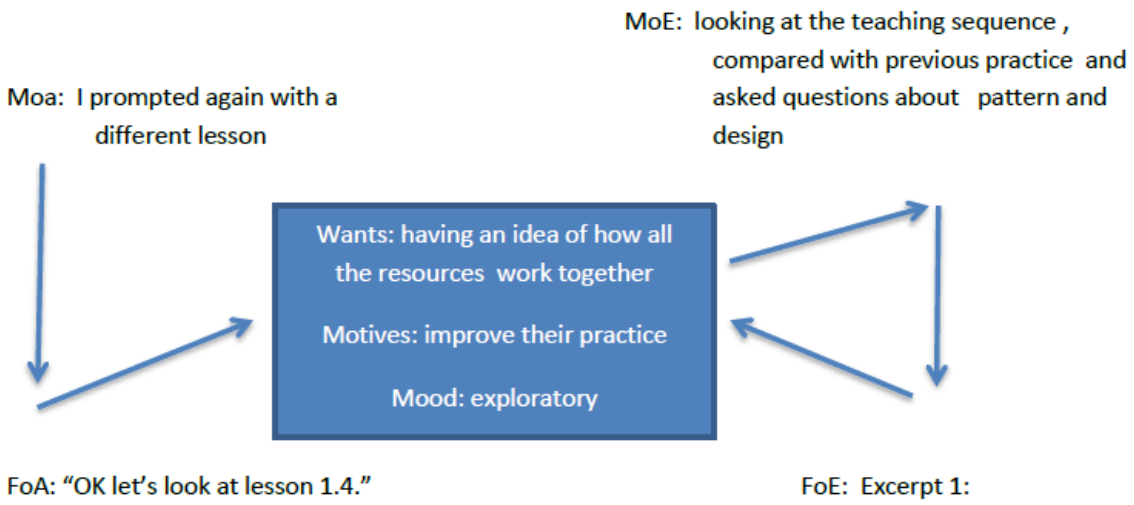
The teachers were confused about what I was trying to accomplish by looking at the lessons. I was carrying the flux of the conversation by prompting and asking questions. Most of their replies were short answers to my questions or more questions. They were in a confused but open-to-whatever-I-was-doing mood.

My strategy was to ask Jane and Cosima questions that would help them reflect on their previous practice and to compare it with what was done in the program that we were looking at. In this case, they had been looking at lessons on terminology and its meaning and in particular the use of words like same, different, more, less, etc. This part of the program emphasizes that it is important to teach one term at a time, and to make

sure the students fully understand each concept/word before teaching another term, and later on, how to put those words together to describe an object.

But first I had to get them to look carefully at the resources, in this case the teacher's guide.





Excerpt 1:

Cosima: The sequence is very logical.

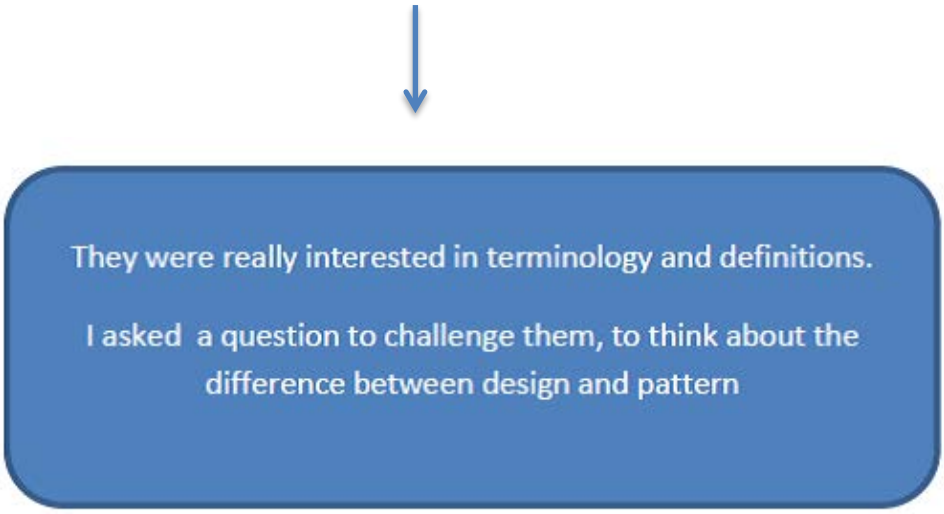
Jane: They are matching patterns.

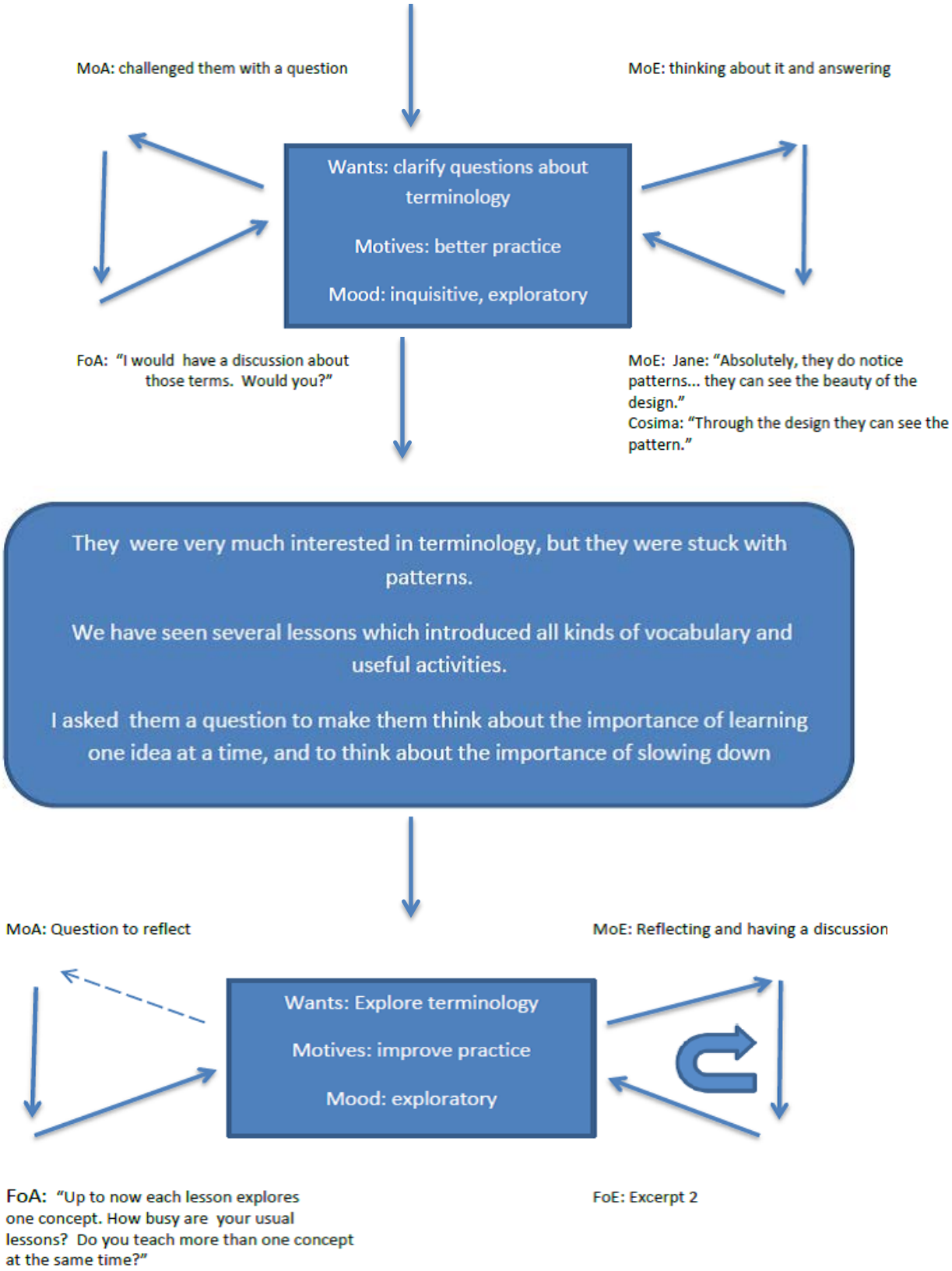
Cosima: That is attributes, all the stuff we do with patterns.

Jane: We have some lovely books about patterns… they can see patterns in the zebra, they can see the repeating pattern, they have information they come with. (She is reflecting and telling us about her previous practice.)

Jane: Can we discuss the difference between pattern and design?

Cosima: Would you use the word design or pattern in the lesson?




MoA: challenged them with a question
MoE: thinking about it and answering
Wants: clarify questions about terminology
Motives: better practice
Mood: inquisitive, exploratory
FoA: "I would have a discussion about those terms. Would you?"
MoE: Jane: "Absolutely, they do notice patterns... they can see the beauty of the design."
Cosima: "Through the design they can see the pattern."
They were very much interested in terminology, but they were stuck with patterns.
We have seen several lessons which introduced all kinds of vocabulary and useful activities.
I asked them a question to make them think about the importance of learning one idea at a time, and to think about the importance of slowing down
MoA: Question to reflect
MoE: Reflecting and having a discussion
Wants: Explore terminology
Motives: improve practice
Mood: exploratory
FoA: "Up to now each lesson explores one concept. How busy are your usual lessons? Do you teach more than one concept at the same time?"
FoE: Excerpt 2

Excerpt 2:

Jane: No, uh [not] really.

Cosima: (reflecting and commenting) I do. I do because to me the ideas are so easy

Jane (reflecting): I was not always aware. I don't think I was aware that I am doing more than one concept, but this is so specific that it makes me recall right back from maybe. (Jane is reflecting on her previous practice versus what she sees in the new program. She is talking more to herself than to us.)

Cosima: Even when we are doing addition... I don't follow concrete, pictorial, abstract. I never realized it is a different thing for them, to see it rather than touch it. (She was going through the same process of reflection as Jane)

Then a conversation ensued between Jane and Cosima about doing too much during a lesson and confusing the children. They discussed how to watch out for that and check each other's lessons for conceptual overload by not overcrowding them with concepts and making them over-complicated. They were looking at the manual and discussing the topics in unit one.

Then, while looking at patterns I made the following comment:

Facilitator: In order to be able to see patterns, perhaps we should look and describe the design.

A discussion ensued about patterns and how to discuss different attributes in class. I did very little prompting afterward. Jane and Cosima discussed a variety of ideas, including what to do to help students articulate what they actually see. They also compared previous practice with what they saw of the new program. Finally, they asked me several questions about how to use the resources for the lessons we just reviewed, but this time it was not about classroom management. Rather, we actually looked at the mathematical ideas. Furthermore, there was a discussion between Jane and Cosima about how to get the parents involved in helping their children with their mathematics. Afterwards, without much prompting, they looked at the following two lessons and they had a discussion amongst themselves. They were the ones who triggered the flow of the conversation.

There was an Aha! moment for Jane and Cosima regarding the business of their lessons in their practice, and how much this can affect their students' understanding. This allowed me to achieve my goal for this task. They started to take a closer look at the lessons and discuss the mathematical concepts in them. They also took at closer look at the activities in the teacher's guide.

Analysis from outside the activity:

What follows is my analysis of what took place from outside the activity of professional development, from the researcher's point of view using the idea of scenarios:

This activity or learning task (LT.1) within a single session included four scenarios. During the first scenario, Jane and Cosima were more than willing to explore but primarily worried about how to use the curriculum materials. They also repeated ideas that I had previously pointed out to them about going from the concrete (toys and manipulatives) to the pictorial (picture representation of objects), perhaps to please me. I noticed that they were also confused about my request. They could see in the teacher's guide what I mentioned to them on previous discussions, but they did not understand why was I insisting they should take a closer look. By the end of the second scenario I realized that Cosima and Jane showed that they had taken a closer look at the resources, but again they deviated to a conversation about patterns. They talked about what was comfortable to them.

The comments the teachers made (FoE) were usually my main clues regarding positioning and learning. Was I able to position the teachers in a way where they were looking at the materials as I wanted? Comments such as: "I think the program is well

thought out" or "the sequence is very logical" indicated to me that they were looking at the sequence in the resources but not at the mathematical content and what was needed to teach it, which is what I wanted them to do.

Regarding the FoA, it was interesting to realize that the format and content of lesson 1.2 was less appealing than the format of lesson 1.4 and this had an impact in the teachers' willingness to look at the resources. Here is an opportunity for curriculum designers to inquire into why this might have been the case.

Finally the MoA changed from just showing the teachers the resources, which contrary to many curriculum designers' hopes, were not immediately engaging to the teachers, to prompting with reflective questions to make teacher take a closer look at the resources. In my case, asking reflective questions provided better results. It is important to note the change in mood from passive confusion and indifference to active exploration that this question engendered. This points to an area for further investigation: what kind of questions should one use, when and how?

Summary:

The examples I provided for each scenario and the learning activity show how the framework can be used to analyze professional development. The professional developer usually plans to use a variety of activities during a session. Each activity can be analyzed by dividing it into scenarios. The beginning of each scenario occurs when the professional developer sees the need to direct or re-direct a task through a MoA. Each scenario contains a mode of address, form of address, mode of engagement and possibly a form of engagement and a flux. All this occurs within a background of motives, wants and moods. By using this framework, I was able to picture the many components that come together to provide an idea of the phenomenon at hand, the interactions between the plan proposed by the professional developer and the teachers' reaction.

The idea of dividing the activity into scenarios and producing a visual device for each scenario provided me with a clear and succinct picture of the process. By dividing the learning task into scenarios, I was able to analyze the many choices and responses

that professional development entails. I examined the modes and forms of engagement to figure out what kind of understanding resulted from the activity. As each scenario evolved, and I learned more about the group of teachers I was working with, I could use this information to continue or re-direct the process.

The challenge I faced was to find ways to recognize the moods, motives and wants to better position the teachers into meaningful learning experiences. I provided some examples where by having an idea about the moods and noticing who is carrying the flux/flow of the conversation, I was, at times, able to use this knowledge to find ways to keep teachers actively engaged, interested and exploring by themselves in a meaningful learning experience. The framework developed in this study has become an important tool in my practice as it has helped me to reflect on and analyze the lived-experience of my professional development sessions as it occurs. I hope other professional developers will find it useful as well.

Chapter 6. Emerging Themes

In the previous chapter I described how to deconstruct and analyze a variety of professional development activities through scenarios. However, as I looked more deeply into each component of the scenarios I realized that the modes and forms of address and engagement are also units of meaning that can provide insightful information for professional development on their own. In this chapter I analyze these components individually, and describe some emerging themes.

I will first look at the forms of engagement because from my analysis it became evident that the forms of engagement that result from each scenario provided the most tangible ideas or artefacts of what took place during each scenario and how to move forward. Even if there is no form of engagement being produced, there is still information there. One can at least deduce that the professional developer's efforts did not work out and that something else has to be done. Working backward, starting with forms of engagement, I then proceed to the description of my analysis of the modes of engagement, followed by a discussion of forms of address, and concluding with an analysis of modes of address.

Forms of engagement

As I was analyzing the scenarios in my data, I realized that I was focusing on the form of engagement as a main source of information to help me find out what has been accomplished during a particular scenario. The form of engagement that was produced provided me with information regarding teachers' understanding, learning and whether the goals that I had set for the activity had been achieved. By focusing on the forms of engagement, I could discern differences in learning. There is, for example, some learning happening in the examples I provided from my data for Scenarios 3 and 4, but only the second one triggered a conversational flux among the teachers, by which they tried to figure out things on their own and discussed ideas that I have not talked about.

I found that forms of engagement are not realized in Scenario 1, and there is no substantial information to provide professional developers with a lead to follow. So either the professional developers retry what they were doing, or try something different, but there is little to guide their choices, except perhaps the mood or some previous information about the participants—assuming they had access to either one of those.

With Scenario 2, there is likely to be some information about what to do next. In the case of the example 2.1 in Chapter 5, the teachers had been using a different textbook than the one I suggested and they were also worried the parents would pressure them to do number operations as soon as possible. They did not know how to resist this pressure. I emphasized the importance of first dealing with the vocabulary and its connection with the mathematical ideas, always taking the time to learn and become familiar with the concepts, and only then to proceed with number operations. That resonated with something in Jane and Cosima's previous experience, and they were willing to explore it further. The form of engagement provided me with information regarding their preoccupations (parents acceptance of the program) to help me address their wants and motives.

With example 2.2 of Scenario 2, I was confused by Cosima's answer. I suspected that she had been reading the manual and wanted to give me an answer that used the new program that was being implemented. Also the curtness of Jane's reply was out of character, for she loved to talk about her practice. In this case I had previous information about the teachers, which allowed me to move on with more fruitful results.

In example 3.1 of Scenario 3, the form of engagement is a series of comments in which Tom demonstrates his understanding of the visual models used by the program, and shows that he knows how and for what purpose they can be used. While this showed clear signs of understanding the models I had been describing, he did not continue long enough to fire up a discussion with me or with the other teachers. I sensed that he was somewhat shy and, as a new teacher, he was too deferential to me and to the other, more experienced teacher. As it happened, the most experienced teacher was somewhat resistant and skeptical about the way the new program was to be implemented and therefore not open to the whole professional development program. This influenced the

mood of the group as a whole. I hypothesized that the combination of his diffidence and the threat of a disapproving colleague was enough to stop him. Nevertheless, the form of engagement he produced already showed that Tom had acquired at least some of the knowledge needed to work with the program, which was his and my original want. With this kind of insight, I usually proceed by encouraging the teachers to try other problems and to explain the solution to the rest of us, find different ways to solve the problem at hand or to compare what they had just learned with what they has been doing before. There is not just one path. There are several options and here is where the wants and the mood also have a “say” on what occurs next. If for example the teachers are resistant or confused, it is important to address the reasons for these moods, if possible.

In Rebecca’s case, she did not like the way the implementation was going to happen and she resisted every activity that involved the program’s resources. To soften things, I showed them some activities they could use in their classroom which were not directly related to the program that was being implemented, but added to the new curriculum, and she liked that. She is a very experienced teacher and she likes to look at new activities to add to her repertoire. I yielded to her wants to engage her with the program.

The forms of engagement that were produced in example 4.1 of Scenario 4, along with the report card guidelines and the mathematical ideas they generated, provided Jane and Cosima with ideas that kept them looking for more. The transcript just shows a few ideas but much more was discussed about patterns, sorting, slowing down, teaching one term at a time and making sure all the students got it, the importance of having students explain what is being discussed in class, etc. I described the process that began with Jane’s comments regarding the teaching of 2-D objects, that then moved on to the realization of how to use 3-D to teach 2-D objects, followed by ‘Aha!’ moments that triggered further exploration in a fully supportive discussion. There is a difference between scenarios 3 and 4. In scenario 3 Tom gave just statements of understanding, whereas in Scenario 4 Jane and Cosima were actively exploring and working on ideas, that not only come from me, but from their discussions, and their supportive conversations. In scenario 4 Jane and Cosima showed an active, independent, and supportive learning that was not shown in scenario 3. There is a qualitative difference between the statements produced

in Scenario 3 and Scenario 4. Noticing this difference, I tried to redirect my mode of address when a Scenario 3 was being produced towards a more conversational context, whereas when situations like Scenario 4 occur, I usually do not re-direct.

There are many possibilities for Scenario 5, but the example presented is interesting to me in that, as a professional developer, I was participating as a teacher in a discussion where each one of us had a different view regarding the “order of the numerals” associated with multiplication and their meaning. Here we find a conflict that was not resolved. However, when I look back at the statements that Rebecca and I produced, I realize that what was lacking was a discussion about number as a unit. I had completely missed this opportunity. I was focusing more on what I thought was Rebecca’s rigid view about how to represent an idea in mathematics. These forms of engagement indicate there is a conflict and that there are important ideas to discuss and perhaps to even develop a workshop around them. Similar discussions to the ones I had with Rebecca in various other professional development sessions, have led to my discovery of misunderstandings some teachers have about a variety of mathematical ideas, such as the meaning of the equal sign. This is valuable information that can only fully come to light through the analysis of lived experience of professional development sessions.

Looking back at this conversation, I see in my notes and vividly remember that I was more focused on the order of the numbers in the equation than on the mathematical ideas of unit and commutativity, which I think were central to this discussion. We all have a personal history that we bring into our practice. In this case what I was thinking about were examples that I found in the past regarding addition, subtraction and multiplication that I immediately linked with this discussion on multiplication. Examples like the following, where one must provide the answer on the left side of the equation:

_____= 3+ 5 or _____ = 4 x 7

I have met teachers and students who have told me that this is not allowed. I see this as showing rigidity of thought; it was the first thing that came to my mind when Rebecca brought up this discussion.

In Scenario 6 all the examples show the ideas that came up were used by the members of the group towards furthering their knowledge for teaching and for understanding mathematics. Forms of engagement become forms of address and modes of engagement become modes of address. There is active engagement, full exploration and everyone is on equal standing in that the group and the professional developer interact together as a unit.

Forms of engagement are dependent on previous knowledge, mood, facilitator's positioning, and other factors. Some of these factors come to light as forms of engagement were being produced. Forms of engagement can provide us with a variety of information: The statements teacher made can provided me with many clues as to what is important to them or what they are focusing on and what was learned.

The following statement illustrates this point.

> Jane: What we were worried about more recently was to make mathematics more real. We use the calendar, and or patterns and relate it to things, and make it as real as possible.

Here Jane was telling us that she is worried about making connections between mathematics with the real world, and she wanted to see more activities where students could relate mathematics to everyday life. Another example can be seen in the following statement by Cosima.

> Cosima: Even when we are doing addition. I am not following concrete, pictorial, abstract. I never realized it is a different thing for them, to see it rather than touch it.

Here I can see that Cosima had an Aha! moment regarding the importance of using manipulatives at all grade levels, not just early primary, when students are first becoming familiar with a concept.

> Cosima: I like the idea, that if we know the order, and why it is, that you can jump around. It's like being an expert in something, if you know how all fits together you can jump into any part. I have never seen a sequence with such a good foundation for Grade 1.

For Cosima having full control and sense of the program was important. Several other similar comments made me realize how important this control and full knowledge of the program was for her, and she was not the only teacher who seemed to feel this way.

> Cosima: This was the point that I thought it was important, kids have to say, there are more knights than horses, there is one more knight than horses. To make them say the two sentences are important.
>
> Cosima: ...again the important part here is to have them confirm the answer by counting out loud.
>
> Cosima: You know what I like about this? It would be great for kids who are struggling, those who have visual discrimination with their letters, those who cannot tell you if this is A or B or and that is A or B to get them to articulate what they actually see. You can see what they can see.
>
> Cosima: It would be good to do a one to one to see, so that they can articulate.

Cosima made similar remarks on various occasions. She came to the realization that she was not allowing her students to use the vocabulary to express what they were observing. Several teachers in other groups came to the same realization. They did not allow their students to articulate their thinking process, they will tell students what to do, and they were mainly focused on having the children get the answer.

The following statements provide some vignettes from Tania's, Tom's and Maria's practice.

> Tania: So I like this activity. It was fun. It got them moving around the classroom.
>
> Tania: They had string a meter long and they were measuring each other...less than a meter or more than a meter it was pretty basic. It was a good review of what they did last year and we had a good discussion after.
>
> Tania: What I like about doing measurement is that there is a lot of movement, and working with ideas that...we have been doing earlier.
>
> Tom: The example that they have here with the birds...I try to use those problem solving models that you showed us as much as I can. I draw the bar model for them. Just having many more parts and the whole, so they connect to something they already know. Visual on the board especially with wings. We can use visual, putting them on the board with magnets, just to show them visually what is going on with

> the problem. Here is the problem [and] how you would solve it. Solve it in your group. So they will come up with a different strategy for the same answer. I partner, the struggling with the not struggling.

> Maria (Grade 1 teacher): Oh they are counting backwards and forwards all at the same time, that is kind of neat, I like that. Personally I don't think I do a lot of counting backwards in the beginning.

Tania's, Tom's and Maria's comments helped me learn about their teaching style, what they noticed, the kind of activities the like to do in their classroom and how interested they were in exploring the new program in their practice. Tania, for example, liked it when her students were moving around and exploring. Tom let me know how he implemented what he learned in our sessions.

> Tom: I did the measurement with rock paper scissors. I did it almost to the letter, though I am not as charismatic as the guy in the movie, but I did it almost exactly the same.

This statement came two weeks after I showed Tom and his group some videos with exemplary lessons. Here Tom was telling me he enjoyed the lesson so much that he did not change almost anything about it.

In the following statements Cosima and Jane describe how they use resources in their classrooms.

> Cosima: I think that using the smartboard will be good to use with this program. When you got things that explain things so well, for them to be able to see it would be wonderful.

> Jane: You do three apples and one apples, and they can actually physically see me adding one more in the smart board.

Jane and Cosima use of the smartboard to teach change, in particular to teach the concept of 'one more'. Comments regarding the smart board were a common occurrence among most of the groups. Several teachers did let me know the use of the smartboard had modified their practice and that they will teach most of their math lessons using this device.

Along with finding out whether teachers were understanding or learning anything about the program that was being implemented, from the examples above it is evident that

forms of engagement can give information about their teaching styles, their wants, their moods, what the teachers notice, their ‘Aha!’ moments, how they use materials and technology in the classroom, etc. Statements like the ones above provided a wealth of information that was useful to me during my sessions with the teachers, in re-directing or emphasizing some particular points. I will share some more of these statements throughout the chapter, given that they provided information relevant to other elements of the framework.

Forms of engagement depend on the modes of engagement. A teacher can arrive at a deeper insight throughout the activity but if he or she does not display an active level of engagement, it is almost impossible for the professional developer to become aware of this fact. Active engagement is a key element for the professional developer to realize what took place during the activity, and as I mentioned before the way I tried to sense engagement is by trying to feel the mood of the participants and observing who is carrying the flux of the conversation. .

Mode of engagement

Our model assumes that motives, motivation, wants and moods influence the mode of engagement the teachers enact. This is based on research that has showed that emotions towards a task can dictate behavior (Seifert 2004). The way I tune into those emotions is by looking at the mood and the flux of the conversation. In the examples I have provided, we find a variety of behaviors, which I call modes of engagement, guided by motives, wants, and moods, where these elements seemed to play a significant role in the outcome of the activity.

The examples provided in the previous chapter show that moods and wants have a great impact on the level of activity and the resultant mode of engagement. Examples 1.1, 2.1, 2.2 in the previous chapter illustrate that confusion or a passive mood inhibits a deep conversation. There was usually silence after a short interaction and it was usually up to me to redirect the conversation that could yield a higher level of engagement. On the other hand an exploratory mood, especially where the group was supportive, allowed

for an opening of the conversation among the teachers (Example 4.1 and the second, third and fourth scenarios in the Activity Example LT.1).

In scenario 6 I found that the mood was usually exploratory, the flux of the conversation was fluid when it was happening, by this I mean that there were also periods of concentration when each of the participants would concentrate on at task at hand. Sometimes when everyone was focused on what they were doing there was total silence, and then when someone asked a question or made a remark the conversation would continue

As I look back at my notes regarding the mood throughout the session, I noticed a marked difference between the kindergarten group and the Grade 2 group. In the Kindergarten group, I was able to observe occasional confusion, but there was more of an eagerness to explore. Cosima and Jane liked to explore on their own terms, sometimes following my lead, sometimes not. But the mood among the kindergarten teachers was interpersonally supportive. They worked well together, they trusted each other and they ended by trusting me.

With the Grade 2 group, I found at first an interpersonally supportive attitude among the members, but less of an exploratory mood. When Rebecca, the leader of the group, realized there were going to be changes carried out by the school administration regarding the implementation of the program that she did not approve of, she showed some resistance towards our sessions. Sometimes Tom and Tania were compliant with Rebecca, sometimes with me. I occasionally noticed some attempts by Tania and Tom to explore and reflect on mathematical ideas as delineated by the new program. As shown in example 3.1 in the previous chapter, Tom was in an exploratory mood. He was working on getting some of the nuances of the program, but the leader's resistance had an impact on what was possible to do or not to do during the sessions. There were other occasions where Tom and Tania were exploring and asking questions, and the flux of the conversation was interrupted by Rebecca's remarks. I wondered many times what would have happened if the leader of this group had not had such great resistance towards the sessions. I sensed that her resistance had an effect on the level of Tom's and Tania's engagement.

Rebecca, showed her resistance by not participating (being silent) or making the following comments:

> Rebecca: We haven't used those terms.
>
> Rebecca: I didn't bring the workbook.
>
> Rebecca: So we will be teaching only with the 2A book? (This upset her because she wanted to teach with books 2A and 2B. This was the source of her resistance. She made this statement out of nowhere while Tom, Tania and I were discussing a lesson.)
>
> Rebecca: I thought we were supposed to tell you how we teach it, not the objectives. Obviously, I am supposed to understand the vision (of the lesson) and I taught my children about what division means, and they tell me it means sharing.

As I looked at the transcripts of my work with the Grade 2 teachers, I was never really in a position where I merged with the group (Scenario 6). Rebecca's resisting mood interfered with the sometimes explorative or being interested mood Tom and Tania presented in some of their interactions. The resulting forms of engagement were usually statements where Tania and Tom show me they understood some of the things I was telling them, or there were statements like the ones made in example 5.1 where the statements made were defensive and not inviting to discussion. As we have seen in previous examples, resistance, and passivity are not conducive to a learning atmosphere. Confusion on the other hand, can lead to some learning when the reasons for the confusion are addressed.

Here is where I noticed that the wants of the teacher had a great impact in their mood and mode of engagement. On one extreme, Rebecca exhibits what Liljedahl (2014) has described in his taxonomy as *resistance* and *do not disturb wants*. Rebecca showed resistance by not wanting to participate, being defensive and challenging. At times she showed she was interested in learning something new, but she did not want to change what she was doing. In addition, because of her leadership position in the group this had a great impact on how the other members acted during the sessions, what Hargreaves (1992) describes as a Balkanic group dynamic.

On the other hand, Jane and Cosima were on the other end of the spectrum. They told me on several occasions that what they were doing was not working and they wanted

a new program that would address some problems they had with their practice. In Liljedahl's terms their wants were at *out with the old*, and sometimes they even venture further into *inquiry*. With the kindergarten teachers there were several instances where all contributed to great discussions. The exploratory, supportive and cooperative moods they display provided the right elements for a fluid conversation, so much so that they felt comfortable in carrying the flux of the conversation on their own. According to Hargreaves (1992) they display *collaborative culture* group dynamic.

The other groups displayed wants and group dynamic more in between these two groups. Grades 1 and 4 showed a *more contrived collegiality*, whereas Grades 5 and 3 were more *individualistic*. Most of the individual wants in these groups tended towards *willing-to-reorganize* or *willing-to-rethink* wants. Very few were willing to go all the ways like Cosima and Jane with *out-with-the-old* wants. Monica, the Grade 4 teacher, was the prime example of someone who was on board with the new program, but she went even further than *out-with-the-old*, she was truly interested in learning new mathematical ideas and questioning teaching practices (*inquiry wants*). However, with most groups, there were times where either individuals or the whole group became interested in learning and questioning a concept or a new idea, and inquisitively explored it, displaying an *inquiry* want. My data showed that usually when teachers displayed an *inquiry* want Scenarios of type 4, 5 or 6 would occur.

The group dynamic and the different wants generated different modes of engagement, as we can see from the two extreme examples I presented in this study. The rest of my data shows this was also the case for other groups.

In this study, the mode of engagement, how teachers act or interact during a particular scenario, was mainly grasped by the flux and the mood of the individuals and the group. Mood is mainly experiential, something the professional developer has to learn to perceive. The flow or flux of the conversation is observed through the level of activity during the teachers' engagement, and is usually easier to perceive than the mood. By focusing on flux and mood I saw great contrasts in the level of engagement and learning. It is important to note that moods and wants are not always clear and I used my experience and previous information about the participants in order to become aware of the mood and

the wants that are affecting the mode of engagement at the moment. I read moods by looking at teachers attitudes in the classroom. If the teachers were not doing anything, I usually asked questions that allowed me to see if the reason for their passivity is fear, confusion, lack of interest, resistance, etc. For example, yawning can indicate boredom. By asking questions or listening to their statements I could also find out more about their wants or motives. If I saw a lot of activity, I looked at who was carrying the flux of the conversation and what they were doing and saying. Were they asking questions? Were they getting solutions to questions? Were they just exploring to see what happens? or Were they just mindlessly playing with some manipuatives? Each situation is different, and being in tune with what is happening with each participant and addressing their needs, as well as trying to change moods that are not conducive to learning can be challenging. In my opinion here lies the strength of a good professional developer.

What has helped me in the past was finding ways to obtain information about the participants before I start the sessions. I did this by asking some questions about their practice on my first survey and by trying to visit some of their classroom while they were teaching. Also during the time I delivered the workshops I tried as much as possible to have some conversations with the teachers to help me understand some of their behaviour, to learn about their wants and motives and to figure out how motivated they were to participate. When, for example, I asked Madeline what was she looking for as she browsed the manual and then she kept quiet during the rest of the session. She told me that she was already familiar with all the concepts in the teacher's guide, and that she did not see anything new. She wanted new resources and to learn about new mathematical concepts which she had not perceived in the Singapore Mathematics program.

The examples presented in Chapter 5 showed a variety of moods and wants. There was confusion, resistance, playfulness; they wanted report cards, they wanted to have full knowledge of how everything works in the program, and some of them did not want change. All of these emotions and wants had an effect on the teachers' stance during an activity and as such influenced their mode of engagement. A question for a future study is: How do all these elements affect engagement and is some pattern evident in behaviours depending on these moods, motives and wants?

Forms of address:

Remillard gives special importance to the forms of address, how the format and form of curriculum materials have an impact on the teachers' interaction with these resources. In professional development, forms of address are not just texts, there are videos, games, activities, even a reflective question can also be a form of address, anything which can expand and extend thinking, and have the potential to promote collaborative dialogues (Barnett, 1987, Lee & Barnett, 1994).

Two interesting themes came forward as I analyzed the impact of the forms of address in professional development. The first is how teachers approached curriculum resources for the first time, and the second is the importance of reflective questions.

Approaching curriculum resources for the first time:

Teacher's guides are only part of the resources with which teachers need to get acquainted. I spent lots of time during the sessions going through the use of resources. I realized that teachers needed to get a sense of how to use the resources not once but several times. They needed to get a feeling for how all these artefacts worked together. My plan to accomplish this was to look at specific lessons: I wanted to use a lesson as an example of how all these resources worked together. I realized that the way I wanted to proceed was clearly a better way for me because I was familiar with the program, but this was not the case for the teachers.

With Jane and Cosima, I had to go through the same explanation several times about how the resources were linked as they had questions about the use of textbooks and workbooks. They were not the only ones as this was a common occurrence with most groups at this school. The flow of sessions was often interrupted when one of the teachers in the group asked about how to use a particular resource in the curriculum. I needed to address these questions first, before continuing with what I considered a more fruitful conversation.

What I found with this kind of attitude towards resources was that the teachers assumed different stances regarding the curriculum materials during professional

development opportunities. Teachers took on various roles, sometimes as learners, teachers, or teachers of learners. With all the groups in this school, as the teachers approached a new resource, they assumed any of these attitudes and acted accordingly:

- As a learner, the teacher asks a lot of questions, but does not explore the resources deeply.
- As a teacher, s/he could be thinking about the difficulty of implementing or managing the new resource into their practice.
- As a teacher of learners, s/he is able to pause and try to see how this new resource or idea will help their learners.

What usually would happen was that teachers were initially more interested in the management of resources than in how to apply them. They were not so much interested in their affordances for learning, but in their complexity for implementation and how they could disrupt their established practices. They viewed it through the lens of the teacher rather than through the opportunities of being a learner.

Here is an example of comments made by the teachers in the grade 1 group as I showed them a lesson for the first time (we had already looked at the resources for a while and I was ready to start looking at the math):

> Erika: Is any of this material ready to use on a smartboard?
>
> Marcia: Who is going to scan the textbook to use on the smartboard?
>
> Erika: I can scan the pages, but I want to get rid of those lines and some of the pictures.
>
> Elisa: Are there homework problems?
>
> Marcia: Is that book behind you also part of the resources that we can use?
>
> Erika: When do we finish with book 1A and start 1B?
>
> Eliza: How long will it take to teach all these lessons? You will say that will be about a week and a half?

These types of comments were typical of most if not all the groups with whom I worked. I have a sense that many of them wanted to be told exactly what to do at each stage. This can be seen in Cosima's comment:

> “This book tells you exactly what to do. I had a general feeling, but these books tell you what to do. (She said this in an approving way.)”(Example 6.2).

This type of commentary was very common, not only from her but also other teachers. Many of them wanted to have a full idea of how to handle all the materials to have a reference that would describe all the necessary steps to teach a lesson, and to have all the necessary manipulatives. This type of desire seemed to be their primal want or goal as they looked over the resources.

Even while discussing mathematical ideas, there will be interruptions out of the nowhere where teacher will ask questions like:

> Tania: I have a question: These workbooks are they intended for homework?
>
> Tom: Why is it that in the workbooks and teacher’s guide we find sheets to practice addition and subtraction horizontally?

However, the more I made them look and work with the resources, the more they became acquainted with the format, and I was able to see this in the data as a gradual shift from the teacher as a learner to the teacher as a teacher of learners. It took time to get Jane and Cosima to take a deeper look at the materials. Their initial questions about the curriculum materials were always about definitions, the layout and how to use each of the materials synchronous with the others. But as I showed in example 4.1 and the LT example in Chapter 5, there is a transformation where Cosima and Jane are first only asking questions about the resources and how they will use them to change their stance, to where they look at how the ideas were presented and how they would help their students learn.

Curriculum materials usually have multiple entry points; we find that some teachers will read the whole teacher’s guide and correlate it with the textbooks, while others will just look at a particular lesson. Some teachers will focus on deep understanding and look at the materials more carefully while others will just look at the procedural algorithms. This also happens with other forms of address. The professional developer can introduce a series of activities or lessons and the teacher will pick and choose what they think fits their practice best. I personally think that one of the effects that professional development can

have on teachers is to help them see how the new resources can help their learners. In this school, at the beginning, I had a hard time with most groups making them look at the activities and the mathematical ideas behind them. With all the groups and most teachers I first encountered teachers as learner or as teachers, but as we worked together and discussed some of the activities, about 70% of the teachers involved in the sessions, at some point or another, took a deeper look at the activities we were discussing, and were able to see how the ideas presented could support their students ability to observe, think and solve. However, for most of them it took more than a session to look at the resources as a teacher for learners.

Reflective questions as forms of address

Reflective questioning can be used by the professional developer as a technique where s/he prepares questions designed to “provide opportunities for the respondent to explore his or her knowledge, skills, experiences, attitudes, belief and values” (Lee & Barnett, 1994, p. 18). By asking a reflective question the professional developer is providing a ‘mental artefact’, which can provide the teacher with the opportunity to think and construct meaning.

In the Scenario 4 example, and the Activity Example LT.1, by asking a reflective question I was able to position Jane and Cosima into a reflective mood where they took a look at their previous practice, and realized how what they had been doing was different from what was expected from them in this program. They became aware that they were doing too many concepts at the same time, and it was negatively affecting their practice.

Another reflective question I often use is to ask teachers about their previous practice, or how do they start the year and why? These reflective questions usually provide me with information about what teachers care about, what they consider important in their classroom, and in this case what their expectations are about the new program. Of course there are times when this is not always the case and I get answers like the answers provided by Jane and Cosima in Example 2.2.

Forms of address cannot only be solid artefacts, they can come in many formats, but their main characteristic is that they provide for a way to expand thinking and

knowledge. Forms of address can have a physical reality and can come in the form of textbooks, workbooks, videos, manipulatives, etc. Remillard (2012) shows that these physical objects have a *structure, look, voice, medium* and *genre*, and I claim that reflective questions have also these characteristics.

Reflective forms of address can evoke a *structure* by helping individuals reflect on content and organization. Questions such as “How do you start the year?” or “How is this different from what you have being doing?” can prompt teachers to think about the content and organization of their mathematics course in order to answer the first question, or to compare the content of what they have being doing with the content of what is presented to them to answer the second one. There is a *voice*, given by the intention of the question, to help them reflect on a particular idea. The look is provided by the mental images that a reflective question could bring. For example, the question “What do you do the first day of class?” can bring up mental images of manipulatives, games and activities that teachers do on that day. *Medium* will be the voice and tone of the one who asks the question, and the *genre* refers to the ideas or concepts and the personal expectations, wants, moods, and motives brought about by those ideas. So we can find in reflective questions the characteristics that Remillard considers significant to forms of address.

There are many forms of address, and they can be used for many purposes. Here is where mode of address comes into play. The planning, the delivery, and the use of these forms of address are the domain of the mode of address.

Mode of address

The professional developer usually puts together an initial plan of action (Mode of address) in accordance to a goal s/he has for the session. Activities are planned and protocols for delivery are set. How close things go according to plan will depend on elements we have discussed before: moods, wants, motives, curriculum formats, etc.

Many times during professional development opportunities, the facilitator attempts to direct or position teachers’ agency towards particular activities according to the goals the facilitator has in mind. The facilitator’s goals and wants are based in large part on what

she thinks the teachers need. Usually what a facilitator wants is different from what teachers want or think they need. However, the success of the sessions will depend on how close the facilitator is inside a realm of possibility, in the sense that perhaps, s/he is not directly in line but close enough that she can get them to do what she wants or get into a compromise where both sides move forward towards compatible goals. So there is an initial planned mode of address and there is an actual mode of address, what takes place during the sessions.

Modes and forms of address are important. For example, Rebecca showed resistance when we discussed the new resources, but when I changed my mode and form of address by showing her a variety of exemplary lessons with easy to get manipulatives that she could use the next day, she became more engaged and her contributions were inviting and greatly instructive. We all worked enjoyably worked together.

In this study I applied a variety of modes of address. Since one of the goals of this study is to provide some insight into what works, what follows is a summary of some of the following modes of address I used and what I observed.

Asking About Previous Practice

I usually like to ask teachers to talk about their practice. This can be an ice-breaker. It depends on how open to feedback, and how comfortable with their practice teachers are. Teachers at this school were not different: when I asked them about their previous practice as an initial mode of address, most teachers were more than eager to share.

In Jane's case, when I asked her about her previous practice, she loved to tell what she had been doing in her class and also invited Cosima into the conversation by letting me know that her colleague would have questions about some terminology they had discussed. I learned about their individual practice and interactions as a group, and also about some of their wants and likes: Jane loved to teach patterns while Cosima had many questions about this concept. As shown in example LT, when I asked Jane and Cosima to reflect on their previous practice and to compare it with what they were expected to do in this new program, it brought moments of reflection and great discussion afterwards. And later on, when I asked them to read Aharoni's book excerpt on not skipping stages,

they were ready to analyze their previous practice using this resource as a background and to have a discussion about it. Also when Jane prepared her lessons, she used previous practice to enrich the lesson in the new program through reflection, comparison and, obviously, by adding what usually works in her practice, which also gave her a sense of validation.

In the case of the Grade 2 teachers, I learned that Rebecca was a collector of resources. In particular, she liked to collect exemplary lessons that she could use for the next day. She taught mathematics with a lot confidence and she enjoyed it. She also wanted me to know that she was happy with the way she had been doing things and that, basically, she coordinated the Grade 2 mathematics program.

> Rebecca: We do a lot of double-digit addition and subtraction from the beginning, because with the Power of Ten we collect ten and one. So if we ask them to add 23 + 13 we are adding 10 + 10 + 3 + 10 + 3, we count the number of tens and make tens with the other numbers, and they are actually doing double digit adding from early on.

I could perceive that the other two teachers considered her a mentor and that they would follow her advice. Rebecca mentioned various challenges they had in their practice and Tom and Tania usually would agree with Rebecca's remarks; for example stating that subtraction was hard and that students did not see the connection between addition and subtraction.

> Rebecca: I don't think we do that much subtraction. By second term we turn our attention to double-digit subtraction and the children usually find even single-digit subtraction more difficult than double digit addition.
>
> Rebecca: They don't see that addition and subtraction are interconnected. We do those number families, but they still won't see the connection.
>
> Tom: We did double-digit adding, and it is difficult.
>
> Rebecca: I know.

Here Rebecca is letting me know about some difficulties she has in her practice and that Tom in her group agrees with her.

The mood was different between both groups in that the Kindergarten session became a supportive conversation that included the opinions from all the participants. Everyone shared their ideas, whereas in the Grade 2 sessions, Rebecca wanted us to know how she did things. Rebecca was happy with her practice and did not want too much change. This attitude was not the case with the Kindergarten group, which was looking for a program to replace what they had been doing until now, and they were open to exploring new ideas. What was interesting is that they talked about previous practice in a different way: Jane described the flow of what usually happened in her class, whereas Rebecca stated what and how a concept should be taught and what was difficult to teach. Jane invited her colleagues to participate by addressing their concerns whereas Rebecca lectured us; she did not encourage the other teachers to talk about their practice and there were not many follow-up discussions.

These two groups were the two extremes among all the participating groups. The other groups' responses fell in between those of these two groups. There were some groups who discussed their practice as a group, there were other were each individual would let me know what and how they taught. Some teachers were full of confidence about what they knew and were happy to share. Others told everyone they did not feel very comfortable about their math knowledge (and therefore their practice) and they were hoping to get some good ideas from our meetings.

The differences in how the teachers individually, and as a group, reacted to this question are large and varied. There were teachers like Rebecca who immediately let me know what they did during the year, as we can see on the previous page and others who were more guarded like Jane and Cosima (Example 2.2). Many styles of teaching were discussed and ideas behind what was important and why varied widely.

Grades 5 and 3 were more *individualistic* groups (Heargraves 1992) and I found a greater variety of answers regarding teachers' practices, as well as modes of engagements (it went from teachers actively letting me know what they did in the classroom, to teachers being afraid or too shy to let me know what they did), when I asked this question. As groups that most often showed a *contrived-collegiality*, Grades 1 and 4

answers regarding their practice were usually given more as a group consensus: one or two teachers will let me know what the whole group did.

I used the information I obtained from asking this question during the following sessions to help engage the teachers in the activities I planned. Starting sessions with this mode of address provided me with a lot of information about what the teachers cared about, what they wanted, and their motives for being there. It also taught me how group dynamics and teachers' predispositions could affect the mode of engagement.

Seeing the old with new eyes

As I mentioned before, when I gave teachers the teacher's guide to read I noticed that many of them just looked at the content in the index and skipped pages until perhaps they found something new that caught their attention; otherwise, they were done and waiting for my instructions. I find that many teachers in the early primary years with whom I have worked in professional development sessions are more interested in learning new activities or ways to teach a concept than they are in taking a second look at the mathematics they think that they know. That may be because they think they have a better grasp of the mathematics than they do. However, when they become aware of new ideas within mathematics they think they know, they will engage in deeper discussions, and they become enthusiastic about conveying these ideas to their students.

In order to help teachers reflect on things they believe they knew well, I gave them several excerpts from the Aharoni's book *Arithmetic for Parents*. This book is quite enlightening, exposing a variety of subtle ideas that one generally overlooks in learning arithmetic. While reading this book, more often than not, teachers realized that there were still things in basic arithmetic that they should know more about, and that this knowledge could help them improve their practice.

As an example, here is Aharoni's (2007, p. 69) discussion on the meaning of addition

> "The expression 3+2 applies to the joining of two groups […] Joseph has 3 flowers, Reena has 2 flowers. How many flowers they have altogether? However, before we go any further, we must discern a subtlety of

> meaning. There are actually two different forms of addition: dynamic and static. In dynamic addition, to join means to change the situation: 3 birds were sitting on a tree, 2 joined them. How many birds are there now? In static, joining signifies grouping of types: A vase contains 3 red flowers and 2 yellow flowers. How many flowers are there altogether? I do emphasize difference; especially because of the link to subtraction […] children find static subtraction difficult".

This passage created quite a discussion among teachers in grades K, 1 and 3. Several these teachers gave examples of students who could add and subtract but had difficulty with problem solving. Some teachers discussed the possibility of changing their students' understanding and problem solving abilities if they emphasized the difference between static and dynamic in class. They wondered why they never thought about this before, and we discussed how to introduce these new ideas in their practice.

Aharoni also introduces the notion that the first time we use the common denominator is not with fractions, but with addition. When we add apples and oranges we get fruit that is the common denominator between these two. I discussed the excerpt of the book where he mentions this fact with all the participating groups. Most of the teachers were intrigued by this idea. Rod, a grade 5 teacher, made the following telling comment:

> "I cannot believe that something so obvious and simple was in front of me all these years, and I never realized it. I do it all the time, add this and that, find the common factor between what I am adding and give an answer."

With most of the other groups with whom I used Aharoni's excerpts, I obtained the results I expected. There was an element of surprise, something the teachers had never realized about a concept they thought they knew well. This triggered intellectually stimulating conversations.

I had a similar reaction with the grades 4 and 5 teachers, when we discussed the two distinct interpretation of division, which most of them had never heard about: measurement division and the partitive division. When the original amount and the number of parts are known, partitive division is used to find the size of each part. When the original amount and the size or measurement of one part is known, measurement division is used to find the number of parts. Most of the teachers I worked with have never realized that

we make this distinction when we are solving a word problem. Many of them commented that being aware about this distinction could have an impact in their students' problem solving.

There are many other examples like this in the data I collected, concepts that teachers thought they knew well, but which had subtleties that made the concept "new" in some way and therefore more engaging.

Sometimes being able to provide a reading to discuss ideas like the ones above would facilitate further interactions because it piqued teachers' curiosity: they become curious to see if there was something else in what they "already knew" that would improve their practice. With most groups, at this school, this exercise also helped to encourage teachers to do further reading of the teacher's guide; the teachers were more open to explore and had expectations of finding something new.

Lesson preparation

All the teachers in this participant school resisted preparing a lesson. When I laid out the plan for Jane and Cosima, Cosima was resistant:

> "Can we personalize what is there? I would have a problem personally with writing a whole page lesson like the one you gave us. It will make me feel like I just got hired! It is because I have to say if people who for do this for a living and mathematicians came up with this, how will I in a day do better. I can personalize it. I don't see the advantage of typing it all up, making it nice and doing that. I would be happy to share it, but I write in the margins things like that. I say I do this and do that. I don't see myself doing that really. I don't mean to make you feel awkward."

Neither Jane nor Cosima (nor any teacher in the school) created an artefact like the one I wanted, but when they looked at the teacher's guide, each described the gist of a lesson.

However, there was a clear difference between the way Jane and Cosima enacted their lessons. Jane's presentations were rich in ideas, self-reflection and also validation about her teaching. She was able to teach one of the lessons I asked her to prepare and she told us all about it. Cosima actively participated during Jane's presentation; she asked

questions and was very interested in what Jane had to offer. The conversation was intellectually stimulating and cohesive, and the teachers were interpersonally supportive and collaborative.

Cosima just talked about what was there in the lesson. I could see that she had read the teacher's guide because she pointed out the most important point needed in order to figure out if the students were actually understanding. But she did not make any comments about previous practice or anything that could add to the lesson as it was.

With the Grade 2 group, Rebecca stated that she only used the textbook and workbook as sources of mathematics exercises. Tania and Tom also did not prepare a lesson as I had asked.

However, Tania mentioned that she had prepared a lesson at some point, where she used the teacher's guide and other resources, and that she enjoyed the activities proposed in the guide to teach measurement.

The reaction of most of the teachers who participated in this professional development was they did not really have the time to write something as elaborate as I had proposed. I pointed out that ideally I would really like them to develop a lesson like the one shown in the Takahashi article and that mostly what was represented in the first column was already developed in the teacher's guide. I mainly wanted them to reflect on what they thought they should tend to during the lesson (what was described in the third column) to be able to give learning support to their students (what was there as an example in the second column).

Only two of the 30 teachers prepared a lesson in writing; 11 others prepared and taught the lesson and their recalling of the event was very similar to the way Jane recalled the lesson she prepared and taught. The teachers enjoyed the new activities and ideas the teacher's guide presented and they almost always added something from their old practice, which I felt made them feel validated and more at ease with the program. Their engagement was intellectually stimulating and the groups in general were interpersonally supportive and the mood became exploratory in most instances. Another 12 teachers read the lesson they had prepared beforehand and that is all they did. In some cases, they also

looked at the important points of the lesson as Cosima did, but the conversations that came up from their presentations were not intellectually stimulating or interactive and the rest of the teachers just listened and did not ask any questions. The rest of the teachers did not even read the lesson beforehand; they just came to the session, read them in front of their peers and some improvised a little. Most of the groups were asked to prepare lessons for two sessions and, interestingly enough, most of the teachers who did not prepare the first time did not change their lesson preparation even after witnessing the sometimes excellent discussions that came about from the presentations made by teachers who had taken time to prepare.

There was no accountability, and teachers were not motivated to write a lesson or work on some kind of 'homework' outside our time together. I found out later that this was not the only professional development they were concurrently experiencing; this might explain some of the resistance I encountered. Perhaps it was also a matter of time management.

Teachers decide the mode of address: Creating report cards and guidelines

I had prepared other activities and some videos I wanted to show Jane and Cosima, besides having them read resources and excerpts from books. However, when they came to the third session and asked me to help them do the report card guidelines I accepted because this is what they wanted and because I could see this was a good way to go deeper into the program as they had to take a good look at what was there in order to assess it.

I accepted the fact that they were in control, and then when I was asked to help I did; first by pointing out how they could use the assessment already included in the program to develop their guidelines (see example 4.1, previous chapter). Cosima proceeded to do what she did the first time she saw the teacher's guide: she tried to figure out if they had enough teaching days to cover it. She thought about copying all the assessments and dividing them in three parts to fit their report card schedule. Soon Jane and Cosima realized they needed to choose among all the possibilities and so I pointed to the main objectives in each unit. From there, they mainly were on their own. They looked

at the objectives of the assessment; if in doubt, they would look at the lesson and, if necessary, they would ask me for assistance. They had a great discussion about the concepts they needed to cover, and how this program did things versus what they usually did: the discussion about shapes is just a sample of what they did for each unit. When they came to session four and asked me to do it again, I was happy to follow along.

This was a learning experience for me. I have added this mode of address to my repertoire, and it has proven to be very effective in getting teachers to look carefully at the program. This mode of address kills two birds with one stone: the teachers get acquainted with the program and they produce their report card guideline. This is a clear example of how to satisfy the teachers' desire for something they can readily use in their practice, and for the professional developer to find a way to get them deeply involved with the program.

Providing exemplary lessons teachers can use the next day

The first thing I was told when I started doing professional development was, "Show teachers a fun activity/lesson that they will be able to use the next day with their students, and they will leave your presentation happy!" I confess I have done this many times; in fact I have done sessions that are just activity after activity, covering a variety of concepts. I often meet teachers after a few months and they tell me how they used an activity I had given them the very next day, even though they were not working at the time on the concept the activity was about; they thought that the activity was a lot of fun and they wanted to try it.

In fact, Trevor Calkins made a tremendous impact in the school (as exemplified in Rebecca's comments), as he provided teachers at this school with many pre-made activities they used with their students. Many teachers told me they really enjoyed the kind of professional development he provided; he gave them everything they needed for the lessons and not much preparation was needed on their part. I do not know if this was his intention, but those were the comments I obtained regarding his program.

At the school I was able to provide teachers with some interesting activities that were a lot of fun, which would also supplement the program. In the case of Grade 2, I showed them two videos and I also provided some ideas in a power point presentation

during the last session, which they really enjoyed. The first video was about measurement and the activity used the game of rock, paper, scissor—a game children know and like—to create a competitive game that used strips of three different sizes and see who would obtain the longest strip. The other one was about seeing patterns within two digit numbers, which was a clever way of making the students do a lot of two digit subtractions willingly to find patterns.

In working and talking with Rebecca I found out that one of the things she most liked to do with her students was number manipulation. This definitely influenced her choice of activities and the second video I showed her group, appealed more to her. Rebecca's comments showed that she is very deliberate when she does something in class and this particular activity could provide her students with the opportunity to find patterns through number manipulation and simultaneously give them a way to practice their subtraction.

> Rebecca: This is fabulous. I want to watch it one more time. It was magnificent. Playing and seeing relationships and patterns. It was great!
>
> Rebecca: We just did it today, and they realized that the answer is 9, 18 and so it's the nine times table and they got the groups. They loved it. For them to borrow means business because we just started that. It was great because they had to practice. It was good to do this activity and review their skills. They were subtracting over and over and trying another, and another. It was great!

During a Powerpoint presentation, when I introduced Rebecca, Tania and Tom to activities and some fun problems to work with, Rebecca asked many questions about the learning outcome of the activity, flow and extensions. She exchanged ideas with Tania, Tom and I. Her last comment to me was telling: she wanted more of those activities. This is what she had wanted all along.

Rebecca was not the only one: several teachers in other grades who participated in the professional development sessions wanted me to show them more lessons like the ones in the video or provide them with resources that included activities and exemplary lessons that they could use in the classroom.

Madeline, a teacher in Grade 5, wanted me to show her websites and to provide her with hands-on activities that she would be able to implement immediately in the classroom and wanted me to show her more activities using technology. I provided her with a few references and resources, but when I explained that this was not the goal of this professional development she stopped actively participating in the sessions and missed the last session, even though she was at the school. She stated that she could read the teacher's guide by herself and did not need professional support to do this.

Lola, a teacher in Grade 3, wanted something she had seen another professional developer do, which was giving them activities and showing them how to use the manipulatives that came with them.

When I asked around, it looked like this was the kind of professional development they had experienced the most: professional developers gave them fun activities and ideas to do with their students. When I said to some teachers that the purpose of my sessions was to look carefully at the program, the mathematics involved and connections between ideas, most of them understood, but they asked me if we could still do some fun stuff once in a while that they could implement in their class without much preparation, which we did. Except for Jane and Cosima, for every session I prepared an activity they could use the next day with their students. I usually did it using ideas from the teacher's guides. After they enjoyed doing the activity I would show them where it came from; this helped in that they actually started to actively look at the teacher's guide on their own.

Summary:

My framework enabled me to discover many themes in my data. As the professional developer, when one reflects on all these components and a picture starts to emerge through units of meaning and preliminary themes, from which I was able to identify essential themes that hopefully provide a better picture of what took place during the professional development sessions.

There were some things I expected to see in my data, like how previous practice can play a role for change; and, how a teacher's resistance can interfere with the learning

of others. However there were a few surprises. I was surprised by how many times during the session I had to go back to questions regarding the use of the curriculum materials, and how much more priority teachers gave to have a better understanding of how all the resources worked together than to the mathematics involved in the lesson. Another surprise was the realization that the forms of address and engagement need not be physical objects, but could be statements that would evoke these physical objects in one's mind.

There were several modes of address that were used in this professional development and seem to work. First of all, asking about previous practice can be a good way to open things up for a conversation, and it is a good opportunity for the professional developer to learn about the teachers practice and modify modes of address accordingly. Something that also worked well was to find the way to help teacher see something that they thought already knew well with new eyes. This was incredibly helpful especially when one was looking at arithmetic, which many teachers thought they had mastered. When I was able to help the teachers realized that there were some ideas that they never thought about and that could be useful for their practice, this created an additional sense of trust in what I was doing, as well as curiosity to learn more. They were more willing to engage with other activities that I brought up later on.

Asking to prepare some lessons was partially a failure. All of the teachers failed to do an example like the one I asked them to do. I was given many reasons but there were two main ones to consider. Most of the teacher told me that they did not have time, and also there was no accountability. If they did not do what I asked, there would not be consequences. For my part, I believe that we missed important learning opportunities. I have done this with other groups and developing a lesson like the one I suggested is quite a learning experience. Just by asking ourselves what kind of mistakes students will make and how can I help them overcome them is a learning opportunity for teachers. However, some teachers did prepare lessons with interesting ideas and it also allowed them to take a closer look at the teacher's manual, which was a good thing. So this activity was not a complete failure.

A substantial amount of research has been done on teachers teaching students in the classroom, but not much research about teaching in-service during the professional development experience. Teachers' expectations, wants, motives, moods and resulting modes of engagement are not necessarily similar to students' and there is much to learn from their behaviours, in order for us to come up with better modes of address, and improve the professional development p[practice. .

Chapter 7. Conclusions

This thesis set out to develop a framework that could help me analyze the *lived-experience* of professional development, with the goal of providing answers to the question posed not just by Deborah Ball (1995) but by most people who do professional development for in-service teachers: What actually works in professional development? As mentioned in the introduction, research on this topic is based largely on post-session questionnaires (where teachers are asked about their experience regarding the session), or school evaluations of students' performance (to find out if there was any improvement after a group of teachers were engaged in a particular kind of professional development). Looking through the literature I was not able to find work that had been done on the *lived-experience of professional development.* Key questions that need to be addressed are: (1) What elements have an impact on the success or failure of the endeavour? (2) Why does the same professional development program succeed with some groups and fail with others? (3) Does the professional developer feel there were instances where s/he made mistakes, and what was learned from those mistakes? More generally, what can a professional developer learn about his/her practice from a particular set of sessions? These questions cannot be answered through questionnaires or performance evaluations alone. As shown in the two previous chapters there are many elements that have an impact on professional development for teachers, and they need to be taken into consideration to help us answer these questions. The impact of these elements can only emerge by studying the *lived-experience* of professional development.

Phenomenology and the process of phenomenological inquiry will not provide all the answers to professional developers since it cannot generate systemic change. What phenomenology can do, however, is to provide access to a process and a way to analytically reflect on that process. By analyzing the *lived-experience* of the professional development process I hope to obtain some insight that could help us develop fruitful ways to engage teachers in changing their practice.

Analyzing long narratives and communication charts of what took place and identifying the important components was a good initial step for my research, but it was difficult to find answers to what could work in a succinct and specific way. However,

through the buildup of the long narratives and analyzing thinking through communication with the charts that I initially worked on (Appendix A contains a sample), I realized the importance of a variety of components (wants, motives, flux, moods) that needed to be taken into account when analyzing professional development, and how the process evolved from a particular mode of address to a form of engagement. Unfortunately these long narratives were cumbersome, hard to follow, and it was difficult to pick up specifics in a clear and concise way that could help me analyze professional development.

What made the analysis difficult was not just the amount of data, but all the components that emerged as I started to do my analysis. As I mentioned before, Remillard's framework combined with Sfard and Kieran's charts (2001) was a good start, but soon I started to add many modifications, like colouring for preoccupations and self-reflecting and supporting arrows, and I started to ask where I could put the moods and wants to make it look all integrated. The best I could do was to write my observations regarding these elements outside the charts. However, by doing this, I was not able to show how all these elements came together. However, all these components that started to appear as I tried to come up with an artefact that could be useful to analyze professional development seemed to enrich the information I was getting about what was important to analyze and why. From my analysis, it became clear that modes and forms of address and engagement could be used to describe professional development situations, given that as professional developers we try to position teachers into getting engaged with a particular learning task. We can wonder what affects teachers' predispositions towards going along with our plans, as well as their wants, needs and preoccupations. These elements are not always obvious to the professional developer. As we start a learning task and try to position teachers with modes of address, it often happens that they will grapple with those modes in a variety of ways depending on their wants and motives. As the session develops a professional developer uses his/her experience to try to figure out if the teachers' actions indicate that the learning experience that the professional developer hoped to provide is developing relatively close to their plans or if redirection is needed. The professional developer is looking for indicators of what has been accomplished.

Sometimes the obvious takes a long time to become clear in the analysis because it is like second nature to us. This was the case with mood and flux: all of a sudden it

became clear to me that I was routinely using these two indicators to try to figure out if the teachers are enjoying what they are doing, if they want to go on for more, if they are understanding, etc. This took some time to realize. The teachers' mood (which is not always completely obvious, but can be deduced through their communication) affects and reflects on whether or not they are willing or interested, or even understand what is presented to them. The idea of flux (who carries it), as a level of activity is also an indicator of the success of the professional development experience. To this we also need to add the teachers' motives and wants, which as we saw also had a great impact on the success of the sessions. Teachers' motives and wants translate into moods as they encounter particular modes and forms of address. Examples in this study showed that if the professional developer is able to address the teachers' concerns or provide them with learning possibilities within their realm of interest, then the mood is more open to exploration followed by reflection.

Unwieldy amounts of data such as those I collected can be difficult to analyze. To make the data work for us we need to summarize and organize it in ways that can influence the decisions we make. I was able to analyze such a complex phenomenon by carefully considering the stages of this process and the artifacts that were used and produced (Moa, FoA, MoE, and FoE), the significant role they played, how at each stage we could obtain information that was relevant to the practice of professional development and how the rest of the session could be affected. I looked again at my data and at Remillard's framework, and by considering the sequentiality of the modes and forms of address and engagement and the realization of the importance of moods and flux in how I perceived engagement, I came up with a shorter visual representation of the process with six basic scenarios.

As I analyzed scenarios, I was able to obtain in a succinct and clear way, information on how each of the components of the process (MoA, FoA, MoE, FoE) could help me realize units of significance. Modes of engagement could indicate teachers' moods and interest, and level of feeling comfortable with what they were doing, so that they could take care of the flux or still expect the professional developer to be in control. In the example for Scenario 3 (example 3.1), Tom made some interesting comments that showed he understood the models, and that he was motivated to learn more about the program. However this was not enough for him to carry the flux of the conversation either

with the other teachers or with me. There had been some tension with the leader of the group, and that had an impact on the flux of the conversation and who carried it.

In Chapter 5, I showed how in the first five scenarios, motives, wants and moods were elements that could separate the professional developer and teachers almost like a barrier. This is why those elements are put in the middle of the graphs representing the scenarios; however, in the sixth scenario the whole group was working together, and there was no real difference between motives, wants and moods or at least these elements were not there as a barrier. Given the importance of mood and flux as indicators of engagement, this is something that should be further explored to make the model developed in this study more complete. It is clear that having such limited theoretical background and knowledge about the want, mood and flux constrained model presented in this study.

In spite of these difficulties, this framework provides a setup that can be used to analyze the process of professional development. It provides a vocabulary for each particular part of the process and the whole process, which is something that was needed in our profession to describe our practice in both a specific and general manner. The implications for the professional developers and researchers in this area are that I established a framework and a vocabulary that can be used to communicate about this process and its parts. This framework also provides an elementary typology of scenarios. By dividing an activity into scenarios we can start developing a database with examples that can tell us how each of the components mentioned in this framework had an impact on the outcome. I came up with six scenarios, which in my experience, are able to describe most of the situations that occur during professional development sessions.

Another of the outcomes of my research is the realization that there exists a wide variety of important components and terms, which are often referred to, but that have not been widely researched or even defined in a precise manner. For example, I remember using the term *level of engagement* as I was doing my analysis - this is a term widely used by many researchers (Thompson, Goe, Paek, and Ponte, 2004) - but I found no formal working definition of this term. In my analysis I realized that for me what provided an indicator of level of engagement was the intensity of activity (flux) and mood, and this is

what I used. Indeed, moods, wants, motives, flux, levels of engagement are factors, indicators, that are needed to describe the *lived-experience* of professional development, and if anything, this study is evidence that there is much more that we need to do to get a better grasp of these important factors.

By dividing activities into scenarios, and then focusing on the modes and forms of address and modes of engagement of each scenario, the analysis was considerably simplified, and I was able to find units of meaning and significant themes as I paused to analyze each of these elements. In Chapter 6, I was able to provide examples of how at each stage I could visualize and obtain some interesting information about the process and how all the elements in the process were connected.

Many themes emerged from the analysis made possible by the framework: how teachers use the teacher guides, how previous practice can play a role for change, and how a teacher's resistance can interfere with the learning of others. Through reflecting on all these components, significant amounts of information started to emerge through units of meaning, which provided me with a better understanding about what took place and what was accomplished during these sessions. The units of significance and the themes provided me with further knowledge about my profession that I will be able to use in the future. I realized for example that I needed to spend more time showing the curriculum materials to the teachers and discussing how to physically work with these materials before getting into the mathematics. My analysis also confirmed the importance of helping teachers to look with fresh eyes at mathematical ideas they think they already know well. I realized the importance of discussing previous practice, and listening to teachers' preoccupations, and weighting the consequences of dealing with these issues appropriately or not.

In Chapter 6, I provided examples of how forms and modes of address and engagement offer useful information, and if necessary connect it to the rest of the process to further learn more about my practice. Regarding the significant role played by forms of engagement, I was able to obtain relevant information for professional developers concerning the various ways teachers approach some forms of address when new

curriculum materials are being implemented. Through the resulting modes and forms of engagement, I was able to look at the affordances of these materials/artefacts.

I also described how teachers' attitude towards the curriculum materials of the program being implemented gave way to three possible postures as they approached these new materials: teachers as learners, teachers as teachers and teachers as teachers of learners. With modes of address, there was a great variety of themes that I was able to analyze given the variety of learning activities and modalities to position individuals: lectures, reflective questions, videos, hands-on activities, etc. I analyzed how each of these modes of address would influence other parts of the process and how, for example, the mode of engagement is influenced not just by wants but also by particular modes and forms of address, as with Rebecca's resistance to the professional development sessions, but if the mode of address provided exemplary lessons that she sensed she could fit in her practice she was open to exploring them.

Mode of engagement is affected by a variety of elements and it would be useful to develop a vocabulary and a working definition for these elements. I have shown that mood, flux, wants, motives, motivation, play a significant role in modes of engagement. As stated previously motivation is a key factor that will influence engagement. Currently there are four dominant theories of motivation: self-efficacy theory, attribution theory, self-worth theory and achievement goal theory, which according to Siefert (2004) seem to be tightly enmeshed.

- Self-efficacy invokes the individual's judgment on his/her competence to execute a task. Individuals who judge themselves as not being able to do a task in a competently would in general avoid it, whereas those who see themselves as capable will more willingly try it (Bandura, 1993).

- In attribution, one must look at the perceived reason and explanation given by the individuals as to why an outcome turned out as it did. Was the individual capable of performing the task, was he/she lucky, was there a lot of effort and hard work, etc.

- Self-worth explains motivation as attempts by the individual to maintain or enhance his/her self-worth (Covington, 1984). Some people do not want to try a task because others will find out that he/she is not capable. Those who feel up to the task would generally like to show how it is done. In the West, success is linked with performance, and a good performance in general will increase the sense of self-worth.

- Achievement goal theory assumes that individuals' motivation can be inferred as an attempt to accomplish goals (Pintrich & Garcia, 1991).

Behaviours are partially influenced by the emotional responses individuals may have towards an activity/task or the context in which the activity/task is taking place (Siefert 2004). In the classroom, students usually form judgments about the activity/task followed by an emotional response based on the task and their own personal facets. According to Siefert, "it is those emotions which dictate subsequent behaviour or motivation" (2004, p.145). Emotions like hope, guilt, fear, and pride, will influence individuals' behaviour (Seifert, 2004). In professional development part of those emotions are the mood, influenced by the participants' wants, motives and motivation, which as I showed in this study, affected their modes of engagement, what can be referred to as their behaviour in the sessions.

Seifert emphasizes the importance of advancing "our understanding of human behaviour in the academic context" (2014, p.145). There has been some research done on behavior patterns of students. Some behaviour patterns researchers have observed in students are:

- *Mastery*: Students usually exhibit positive emotions, are adaptable, persistent, and learn from their mistakes (Dweck, 1986; Covington, 1984; Seifert & O'Keefe, 2001).

- *Failure avoidance*: Students are usually afraid of failing. They avoid taking risks. Some of them lack confidence in their abilities but try to maintain ability perceptions by others. They may also tend to believe the attributions that may bring them success or failure are out of their control (Dweck, 1986)

- *Learned helplessness*. Students believe outcomes are out of their control and therefore his/her efforts are futile. They usually blame themselves for their failures and do not take credit for their success. They are usually work avoidant (Siefert 2004).

- *Bored:* Students find little meaning on the work they are doing. They believe themselves capable of doing the task at hand but they are usually disinterested and they avoid doing the work that is required of them. Some of them will do only the work necessary to get by (Siefert, 2014).

- *Passive-aggressive or hostile work-avoidant*: "The hostile work-avoidant student is characterized by minimal or no effort as an attempt to seek revenge on the teacher. For some reason, the student is angry with the teacher and is withholding effort as a means of expressing that wrath" (Siefert 2004, p. 147; Jarvis & Seifert, 2002).

There is substantial amount of research of how students behave in the classroom, and some patterns of behaviors have already been worked on. However this is not the case with teachers during professional development. In my study I assume that motivation, motives and wants have an impact on the mode of engagement. I gave a few examples, but the question of whether there are any patterns in teachers behaviour during professional development remains open. How are these patterns of behaviour similar to or different from the patterns of behaviour that students exhibit in the classroom. What behaviours (modes of engagement) do teachers display during professional development and what triggers those behaviours?

The examples in Chapters 5 and 6 provide the reader with a variety of modes of engagements (behaviours) being exhibited by the teachers, influenced by their wants, moods, motives and motivations. But can we find any patterns? I discussed how different wants (inquiry, out with the old, resistance, etc.), can have an impact on how teachers behave (mode of engagement), their mood, the forms of engagement they produce and ultimately their learning. I sincerely believe this kind of research needs for us to look at the live-experience of professional development, because the observations are experiential.

After developing this framework I started to use it during my practice. It has helped me to create an image in my mind of the type of scenario that is being enacted with the corresponding modes and forms of address, the motives, wants and moods, who is carrying the flux of the conversation, and how to proceed. The post session self-reflection has become a deeper and clearer process given that I am able to evaluate how elements in the activity interrelate, and produce a mental image of the scenario that occurred and forms of engagement that came out.

Sometimes it was not easy to look back at what I had done as a professional developer. There were times when I could see that I was not taking advantage of opportunities or did not realize that I should not make comments if I was not fully prepared. Learning happens through experience and making mistakes, and to acknowledge those mistakes is not easy, especially if we have to acknowledge them publicly through a publication, but this is the reality of professional development. It is only through reflection and practice that one is able to master this profession. The goal is to learn from our mistakes and experiences and from the advice of others, to improve our practice. This framework is useful in that it provides us with a vocabulary, and a visual device that describes the professional development process that can be used by other professional developers in order to share experiences that will allow us to learn more and improve our practice. The framework is a good start; it was able to provide me with an insight into many of the components that are part of this phenomenon, and hopefully it provides a step forward towards answering Deborah Ball's question: What works in professional development?

In the end it is my hope that research like the one initiated in this dissertation will be helpful in designing professional development workshops that are more meaningful and helpful to all teachers.

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Appendix A.

Flowchart Examples

Kindergarten Example:

I had four sessions with the Kindergarten teachers: a short meeting which lasted about half an hour and three long meetings that lasted between two and a half and three hours, respectively. What follows is a sample of a table I made using Sfard's and Kieran's flow charts for this group.

Table K.1

Mode of address: Having teachers talk about their practice.

I started with the question "How do you usually start the year in your math class?" I did this because we were going to look at the program from the beginning and I wanted Cosima and Jane to see the differences/similarities between what they were doing and how that might change with the use of the new program. This is also a good way to learn a little more about the teachers and their practice. (Just as a reminder, I am bracketing my personal perceptions and opinions in blue).

Table K.1	Facilitator	Jane	Cosima	Notes
I asked: How do you usually start the year in your math class? I wanted to learn about their previous practice, (indicated by the red arrows). Jane replied: with patterns Cosima replied: sorting and then patterns.	O	O O	O O	
Facilitator: So what kind of patterns? Jane went on into a long monologue about her practice (indicated by the red curved arrow). She talked about	O	O	O	Excerpt K.2.1.A

patterns with colours, in nature, the books she used and her demeanour was animated and enthusiastic. During the conversation she also pointed out that Cosima might have a question about terminology and definitions (indicated with the green colour).		O O		
Cosima asked questions about patterns, but mainly wanted to know what the difference between pattern and design was. I answered her question.	O O	O O	O O	
Cosima was worried about how the terms design and pattern are used interchangeably in the real world, but not in Math. We had a three-way, very animated supportive discussion about patterns, design, and the difference between design and pattern, and how to have a discussion with the students about these terms (back and forth discussion indicated by the double arrows, which show that in the end is was not a pro-active or reactive but supportive conversation).	O O	O O	O O	Point of inflection
We finished the discussion with Jane's comment:	O O	O O	O O	

"What we were worried about more recently was to make mathematics more real. We use the calendar, and or patterns and relate it to things, and make it as real as possible."				

- Red arrow: previous practice
- Green arrow: discussion about terminology and definitions.
- Blue arrow: reference to the program

I started with the question "How do you usually start the year in your math class?" I did this because we were going to look at the program from the beginning and I wanted Cosima and Jane to see the differences/similarities between what they were doing and how that might change with the use of the new program. This is also a good way to learn a little more about the teachers and their practice. (Just as a reminder, I am bracketing my personal perceptions and opinions in blue).

Units of meaning:

The teachers worried about getting their students confused with terminology, but after our discussion they were more willing to have a discussion about vocabulary with their children.

Excerpt K.2.1.A: Jane's answer to my initial question was patterns, and Cosima's was sorting. Sorting is what the Singapore Mathematics program starts with. I was a little puzzled about Cosima's answer because I knew from conversations with them that they usually synchronized their lessons. After each one of them made their statement, there was nothing further, and they were waiting for me to go on, so I asked the question: "what kinds of patterns?" (I wanted the conversation to move on). Jane started a very lively and descriptive monologue about what she did to teach patterns. She was emphatic when she said, "we have gone bigger, almost like an explorer going on a safari to catch patterns everywhere." Cosima wanted to discuss and clarify the definitions and use of the terms pattern and design, and how to explain to the children how in real life these two terms were used interchangeably, while in mathematics, the two are very distinct from one another. The discussion went on for at least a good ten to fifteen minutes.

Wants:

Jane and Cosima used this opportunity to clarify particular terms and definitions that they had been teaching but had questions about. They wanted clarification from me as well as a methodology to teach it.

The facilitator's wants were met, since I found out more about some of the things that they

were doing. I found out how they were dealing with patterns and helped them with some of their questions as well as seeing what they were doing about making connections between mathematics and the world around them.

Reflection:

The teachers reflected on taking risks while discussing mathematical terminology with students. They acknowledged that sometimes confusion about terms can lead to some real productive thinking.

Themes:

- Asking teachers about their practice to get them to engage in a conversation: We can see that it took very little to get the teachers animated into conversation and discussion. My experience is that many teachers like to talk about their practice, especially when there is some validation or appreciation about what they are doing.
- Taking risks while teaching: We discussed terminology and then they discussed the possibility of taking risks while discussing it with their children. Jane and Cosima discussed the possibility of having in-class discussions with students about terminology, not just to state the definition and hope for the best. There was also a discussion about some activities to teach patterns.
- Addressing their questions in a way where teachers can reflect on their practice.
- Jane and Cosima were not very happy with how they have been teaching mathematics in the past. They felt they did not have a coherent program.

Point of Inflexion: As the facilitator took care of their wants and answered their questions regarding terminology, which resonated with issues concerning their previous practice, the exploratory mood changed into a supportive discussion regarding teaching of terminology and their practice.

Mood of engagement: exploratory (Jane and Cosima) to interpersonally cohesive.

Grade 2 Example:

I had three sessions with the Grade 2 teachers which lasted three hours each.

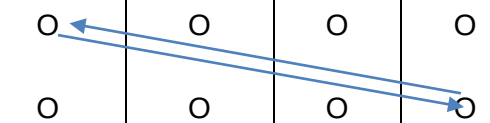
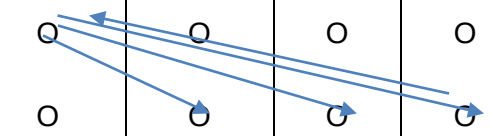
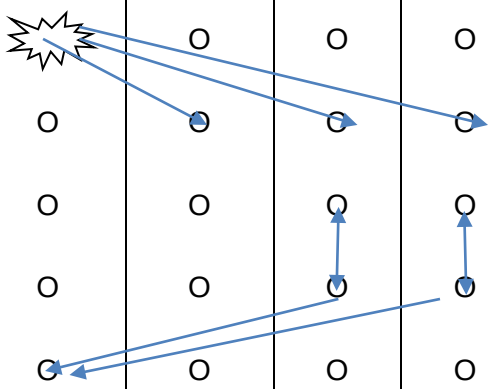
What follows is a sample of a table I made using Sfard's and Kieran's flow charts for this group.

Table 2.1

Modes of address: Explaining the two models of problem solving

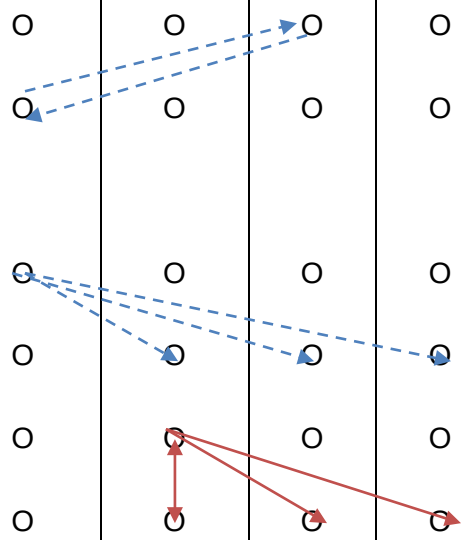
How the bar model is used to model part-whole and comparative problems and possible interceptions.

Table 2.1	Facilitator	Rebecca	Tania	Tom	Notes
Facilitator: "So last time we discussed a little bit about key words and I couldn't give an example about using the phrase take way for an addition problem, but I thought of one during the break. Mary had 10 marbles, Sam has more but if I take away two of his marbles, he will have the same number of marbles as Mary's. Sam has how many marbles?" (Silence)	O O	O O	O O	O O	
Facilitator: So I drew the bar model picture of the problem and I basically gave a five minute lecture about key words, and taking away, etc. "So here we are what?" Tania: "Comparing…the problem that you gave us, can't we use the part whole model with that?"	 O O O	O O O O	O O O O	O O O O	

Facilitator: “Because here we are comparing and looking at the difference not part of a total.”					
Facilitator: “But [you] could set it up as part whole. How will you do that?” Tania: “I just do a bar, but yes I can see how information about what is happening is missing with that.”					
Facilitator: “Let’s look at other problems. Page 24. Ally and David have 14 cards. Ally has 8, how many does David have. What kind of problem is this?” Tom: “Part whole. I guess if I wanted to know the difference I have a comparative model. How will you set that up?”					
Facilitator: I explained to them how to set it up, how to indicate different amount as well as a two-step problem. Tom and Tania were reflecting on what I told them and then asking questions.					

Facilitator: I went on, and asked them to look at page 26 in the work book. Rebecca: “I didn’t bring the workbook.” Facilitator: “You can share with Tom.” Rebecca: “I can run back for my book.” Tom: “Here, let’s share.”	O O O O	O O O O	O O O O	O O O O	
Facilitator: “How will you explain the idea of part whole versus comparative?” Rebecca: “The easy way is to look at the graph. If you look at the graph and you see somebody has more and somebody has less, and then you go for the equal number and figure out how many more how many less. For me that visual makes it easier. I [like] playing a card game with my kids. We are making ten, we lay it down as a graph and how many more you got than me or less than me. I think it's...I don't know.”	O O	O O	O O	O O	
Facilitator: “That is a good way to do it. Let’s do it with an example first. How will you set problem number 2 for your students?”	O O	O O	O O	O O	

Rebecca: “44 green apples, and other one with 37 red apples, basically what you did on the board there.”					
Facilitator: “Any other suggestion?” Tom: “I line up counters, use green and red counters. In one line or two lines and we can discuss parts or looking for the difference, comparing.”	O O	O O	O O	O O	
Facilitator: “Yes, here in the comparative model, it's important to tend to vocabulary. You can talk about the difference between 9 and 4, or that there are 5 more in 9 than in 4 or that...” Tania: “This would be helpful with subtraction. They can see why they have to subtract.” Tom: “They can see where difference is coming from.”	O O O O	O O O O	O O O O	O O O O	
Rebecca: “So we will be teaching only with the 2A book?” Facilitator: “Yes.” Rebecca: “What is going to happen to the children we now have?”	O O O O	O O O O	O O O O	O O O O	

Facilitator: “Grade 3 teachers will only be teaching the 3A very slowly and consolidating 2B.” Tania: “Who is going to teach 2B next year?” Facilitator: “Nobody, but the year after the Grade 3 teachers will be teaching 2B and 3A.” Silence. Facilitator: “I thought you had already been told. I am sorry.” Rebecca: (to the other teachers) “We will have more time; we will have more fun and spend a lot of time in the vocabulary. I was thinking, I introduce the word difference from the beginning of the year. We have some talent sets that we have from years ago and then there are all these resources for riddles. We can make it even richer. Even richer probably by not feeling that we need to do so much. So that is fine.”					

- Blue arrow: new program
- Red arrow: previous practice
-  : A lecture is being given.

Units of meaning: As the session developed I sensed that my role became more of a trainer than that of a facilitator. I was expecting some comments about my first remark but nothing, however, after I explained the models and we started working on solving a few problems, Tom and Tania were more actively engage. They would make some

comments amongst themselves and then ask me questions that would lead to a short lecture explanation.

We almost had a breakthrough (2.18) when Tom added some remarks in support of Tania's comments. Unfortunately, Rebecca asked me what was going to happen next year, and this changed the conversation towards a great preoccupation that Rebecca had and that I felt was a source of resistance on her part as she participated in these sessions.

I thought that this group had had a discussion with the administration or at least that they had been told what was going to happen, but I was the one who gave them the news about how the program was going to be sequenced. This created some tension in our sessions, even though I was not responsible for this decision.

Wants:

- I wanted them to understand the part-whole and the comparative models and have a discussion about them.
- Tania and Tom wanted to learn more about these models.
- Rebecca wanted to know what was going to happen next year with the program.

Themes:

- Reflective and supportive reactions show a level of engagement that can bring about some opportunities for learning
- It is important that teachers feel that their opinions are part of the process for change, and some of the issues should be discussed with all the participants in the process.
- An unhappy or resistant teacher can stop or disrupt learning opportunities.

Mood of engagement: passive first, then there were some exploratory moves from two members of the group and then the third member stopped the discussion. There was

resistance from a member of the group. The group is not working together, but there were collaborative and interpersonal cohesive moments between two members of the group.

Appendix B.

Lesson sample and Surveys

First Survey:

I gave this Survey the first day we meet for are group professional development:

Name_____

1.- Number of years teaching experience_____

2.- Please identify your strengths as a teacher.

3.- Think about your first year(s) of teaching and compare what you did then with what you do now. What are some the important ways your approach to teaching has changed and why?

4.- What forms of professional development and/or support would you consider most useful and why?

5.- At which times of the day are you most willing to participate in professional development activities?

6.- What do you tend to the most went you are teaching mathematics?

7.- Is there something about your practice that you want me to know about?

Final Survey:

Gave this survey at the end of the last session. I only got 10 of them back.

Name (Optional) _____

Grade you are teaching this year_____

Grades you taught in the past_____

1. Other than tests, how do you assess student learning?

2. How do you challenge your students? (Give an example to back up your answer.)

3. Tell us/me about your planning habits. If there a particular format that you use? Do you plan on a weekly basis?

4. How would you write a plan and what is included in each plan?

5. Describe the first five minutes of your math class.

6. How would you decide what should be taught in your classroom?

7. Provide an example of a successful lesson that you created and used.

8. How will you ensure students understand your lesson's learning objectives?

9.. How do you evaluate your own teaching?

10. How do you encourage students to learn? Can a student be forced to learn?

11. What is the number one factor that contributes to student learning?

12. What parts of your teacher training do you use the most

13. What type of math program did you use in student teaching?

14 If I walked into your classroom during math time, what would I see?

15. How will you make math relevant to the students

16. What do you understand the inquiry method to be in mathematics?

17. What is the most significant professional development you have received?

18. Were our meetings helpful?

19. How could I have been more helpful?