Teacher Participation in Continuing Professional Development: Motivating Factors and Programme Effectiveness

James Calleja
University of Malta
james.j.calleja@um.edu.mt

Abstract: Teachers choose to take up professional development courses for different reasons. This paper reports on the motivations of a small group of Maltese secondary school teachers of mathematics in joining a continuing professional development (CPD) programme aiming to support them in Learning to Teach Mathematics through Inquiry (LTMI). During mathematical inquiry, students assume a central active role – wrestling with ideas, asking questions, exploring and explaining meanings – supported by the teacher as a facilitator. This paper also explores teachers' understandings and their reported experiences of programme effectiveness. A qualitative design using thematic analysis was used to investigate views, experiences and accounts of LTMI features that teachers believed to be effective for their professional learning. The data reported here was taken from a focus group held with teachers at the end of the CPD programme, and three interviews held with the same teachers before, during and after their participation in CPD. Findings reveal intrinsic factors motivating teacher participation, namely: (1) teachers' will to develop knowledge about teaching; (2) their beliefs about the benefits of inquiry; and (3) their need to change classroom practice. The key aspects that teachers voiced as effective throughout their CPD experience were learning by being part of a community, active learning and immersion in practice-based understandings.

Keywords: Continuing professional development; teacher motivations; inquiry-based learning; community of practice; programme effectiveness

Introduction

Teachers are usually unclear about the meaning of inquiry and how this may be translated into classroom practices (Chin & Lin, 2013; Ireland, Watters, Brownlee, & Lupton, 2012; Towers, 2010). Moreover, contextual constraints

and system restrictions are challenges that teachers often report in implementing inquiry in their teaching of mathematics (Anderson, 1996; Engeln, Mikelskis-Seifert, & Euler, 2014). One way of addressing these challenges is to offer CPD opportunities for teachers that provide pedagogical training and support in using inquiry practices (Bruder & Prescott, 2013).

Professional development is an on-going and long-term process (Loucks-Horsley et al., 2010) providing teachers with collaborative opportunities to design, implement, share, discuss and reflect (Guskey, 2002; Putman & Borko, 2000) to bring about the desired changes in classroom practice. A CPD programme was designed with this end in mind – to provide a blended approach of *off-the-job* summer workshops and *on-the-job* meetings for secondary school teachers of mathematics to immerse themselves in and learn about inquiry. By drawing on seven case studies, this paper reports on two areas: teachers' motivations to participate and their understanding of 'effective' CPD. Specifically, the research questions were:

1. *What motivates teachers to learn to teach mathematics through inquiry?*
2. *What features of CPD were considered effective by the teachers?*

In the next sections, I provide literature related to CPD, design, implementation and effectiveness. This is followed by presenting the current situation in Malta with regard to teacher professional development with a focus on teacher participation in an international European Union project in promoting inquiry. Literature on inquiry-based learning (IBL) and its importance for Malta are reviewed before moving onto teacher motivations and views about what makes effective CPD. Next, I outline the study and the CPD programme design. The study methodology is then presented, followed by data analysis and key findings emerging from the qualitative data shared by seven participants. Finally, this paper outlines conclusions and implications for designing and conducting effective and replicable CPD programmes.

Continuing Professional Development

Literature on CPD reveals that there are many and varying definitions. For the purpose of this paper, CPD is taken to encapsulate the personal and the professional learning of the teacher (Earley & Bubb, 2004), that is, "those processes and activities designed to enhance the professional knowledge, skills, and attitudes of educators so that they might in turn, improve the learning of students" (Guskey, 2000, p. 16).

There seems to be two distinctive approaches to providing CPD – the 'traditional training model' and the 'sociocultural model' (Mansour,

Albalawi, & Macleod, 2014). While the 'traditional model' views learning as the acquisition of skills that teachers may take from a course and apply into their classrooms, the 'sociocultural model' values knowledge, teaching and learning as being socially created and culturally enacted. From the vast literature of studies on mathematics teachers' CPD, it is clear that there has been a shift towards programmes that model inquiry-based pedagogies (e.g.: Back, Hirst, De Geest, Joubert, & Sutherland, 2009; Garet, Porter, Desimone, Birman, & Yoon, 2001; Loucks-Horsley et al., 2010) and *authentic activities*, that is, CPD activities that are similar to what teachers could be doing in their classrooms (see Brown, Collins, & Duguid, 1989).

There is widespread consensus about what constitutes effective professional development (Guskey, 2000; Loucks-Horsley et al., 2010; Putman & Borko, 2000). According to Loucks-Horsley et al. (2010, p. 5):

> It is directly aligned with student learning needs; is intensive, ongoing, and connected to practice; focuses on the teaching and learning of specific academic content; is connected to other school initiatives; provides time and opportunities for teachers to collaborate and build strong working relationships; and is continually monitored and evaluated.

Despite all that we know about what renders CPD effective, the challenges and barriers towards successful implementation are still to be addressed (Bubb & Earley, 2013; Guskey, 2002; Putman & Borko, 2000) – both abroad and particularly in the local context. Locally, it seems that CPD providers (institutions and schools) still conceive teacher professional development as an isolated venture of off-site workshop training disconnected from practice, rather than an ongoing collaborative on-site experience of practice-oriented development and learning.

Researchers interested in teacher professional communities have drawn on the community of practice (CoP) perspective (see Jaworski, 2006b; Lave & Wenger, 1991; Wenger, 1998) – also referred to as learning communities (Attard, 2012) or professional learning communities (DuFour, 2004; Watson, 2014) – to explain the social processes shaping teacher learning. Communities of practice are dynamic learning communities in which participants engage "in actions whose meaning they negotiate with one another" (Wenger, 1998, p. 73). The identities of participants thus become shaped as they engage with others. This situated perspective of learning has been applied widely to teachers' learning to teach (Coburn & Stein, 2006; Jaworski, 2006b; Lave & Wenger, 1991). In this study, *learning to teach mathematics through inquiry* (LTMI) was designed to bring in "a critically questioning attitude towards practice and knowledge-in-practice that allows critical reflection on the

practice of teaching" (Jaworski, 2007, p. 1693), thus engaging teachers in sharing and negotiating inquiry-based classroom practices.

Teacher Motivations to Participate in CPD

Literature shows that reasons why teachers participate in professional learning include the development of knowledge about teaching (Anderson, 2008), their 'will to learn' (Van Eekelen, Vermunt, & Boshuizen, 2006) and career-related purposes (Ng, 2010). Motivational theories tend to rely on two contrasting views related to human nature: (1) humans are hesitant and require some external stimulus to venture on things; or (2) motivation is internally stimulated (see Bassett-Jones & Lloyd, 2005). There may be extrinsic as well as intrinsic factors that explain what motivates people in their workplace and, in particular, what motivates teachers to pursue professional learning. As to extrinsic factors, the school or institution may 'dictate' or advocate teachers to engage in CPD. This is usually the case with compulsory courses locally initiated by the Ministry for Education and Employment (MEDE) to address curricular needs or when government-initiated reforms are being introduced. On the other hand, job satisfaction and the need for recognition may be considered as factors that intrinsically motivate teachers to engage in CPD. In a study with teachers in Ireland, McMillan et al. (2014) found that motivational factors fell under three categories: personal, school-related and system-wide. Teachers' personal choice for engaging in CPD included personal interest, career advancement and a perceived need to improve their classroom practice. School-related factors were also viewed by teachers as beneficial and motivating. Following participation in CPD, teachers in the study reported by McMillan et al. (2014) were encouraged by their school to provide feedback to colleagues, hence supporting their professional learning community at school. Finally, the main system-wide motivator identified by these teachers was the mandatory nature of courses held during school hours. This scenario is very similar to the local context as generally teachers have little choice but to take the course offered to them. This constraint tends to limit teachers' motivation to develop professionally.

Teachers' Views of Effective CPD

There are two main approaches to understanding what 'effective' means in relation to CPD initiatives. For example, Joubert and Sutherland (2008) list characteristics that include encouraging purposeful networking; being grounded in classroom practice; and, supporting reflection and inquiry by teachers. On the other hand, Guskey (2000) evaluates CPD in terms of outcomes using a five-level model:

1. Participants' reactions.
2. Participants' learning.
3. Organisational support and change.
4. Changes in classroom practice.
5. Student learning.

This model offers a helpful way of looking into the outcomes of CPD at different levels. The *Researching Effective CPD in Mathematics Education* (RECME) project investigated 30 initiatives representing different models of CPD for teachers of mathematics in England, and outlined a number of factors related to effective CPD as reported by teachers (see Back et al., 2009). When Joubert et al. (2008) analysed these factors within the levels outlined by Guskey (2000), they found that participants valued the knowledge and understanding of practice demonstrated by CPD leaders and the practical advice provided during sessions because this was directly applicable to their classroom. Teachers also appreciated CPD that was stimulating, enjoyable and intellectually challenging. Long-term and reflective engagement with CPD, opportunities for networking with colleagues, an expectation to try out new ideas and report back their experiences, and opportunities for discussion were all mentioned as factors that contributed to their active involvement in CPD. In addition, teachers also reported that CPD gave them confidence, and increased passion and energy to try out new things. However, Guskey's (2000) fifth level outcome was missing as teachers did not report improved student learning as evidence of the effectiveness of their CPD. They did, however, report on improved students' attitudes towards their engagement in learning mathematics and persevering with challenging tasks.

Professional Development in Malta

Teachers in Malta are entitled to a maximum of 30 hours of CPD each year. This training time is equivalent to approximately 7.3 days, which is below the TALIS[1] average of 15.3 days dedicated to CPD in Europe (OECD, 2009). CPD duration and format are established by MEDE through a collective agreement signed with the Malta Union of Teachers, and changes may only be possible following new negotiations. CPD opportunities for teachers usually occur at school level but they are also provided by MEDE. Teachers in the independent sector may choose to attend this training, yet training is usually organised in-house (Attard Tonna & Calleja, 2010). Until 2016, MEDE was the main agent for providing in-service teacher training in Malta (see Ministry of Education and Employment, 2012). Figure 1 below delineates the CPD

---

[1] Teaching and Learning International Survey (TALIS) examines how countries prepare teachers to face today's diverse challenges in schools. TALIS asks teachers and school leaders about their work, working conditions and learning environments covering themes such as continuing professional development.

opportunities provided to secondary school teachers at the time of the study. Besides these CPD obligations, teachers may also undertake post-graduate courses offered by the University of Malta and other institutions.

Figure 1: CPD opportunities for teachers in Malta

CPD ACTIVITY	PERIOD	DURATION
PROFESSIONAL DEVELOPMENT SESSIONS	After school hours	*3 two-hour sessions (6 hours)*
SCHOOL DEVELOPMENT MEETINGS	Within school hours	*3 two-hour sessions (6 hours)*
SCHOOL DEVELOPMENT DAY	Within school hours	*1 full-day (6 hours)*
INSET TRAINING	In July (end of school year) or in September (before school year) *	*3 half-day sessions (12 hours)*

* *Scholastic year ends after the first week of July and starts in the last full-week in September.*

Generally speaking, CPD activities are still informed by a 'deficit model' (Brown & Mcintyre, 1993) with the assumption that educators have deficiencies and CPD would serve to correct these. From my professional experience, I am aware that training is usually provided by outside experts and most sessions tend to be led by PowerPoint presentations. In such cases, CPD takes a top-down approach of knowledge transfer to participants who, in turn, end up having to listen for most of the time with little or no input from their part. Besides disregarding teacher motivation and agency in learning and development, this model is found to be ineffective (Little, 1993; Loucks-Horsley et al., 2010) due to the lack of transferability of knowledge that teachers take into their classrooms.

CPD through a learning communities approach first featured with the publication of the National Minimum Curriculum document (Ministry of Education, 1999). Yet, as Bezzina (2002, p. 65) noted, "the underlying feeling one gets is that the authorities may be assuming that it can just happen". I believe that the development of supportive structures that enhance the ongoing professional growth of teachers is still being overlooked today and, as a result, the concept of creating and sustaining learning communities is generally missing in local schools (Attard Tonna & Calleja, 2010; Bezzina, 2006).

On a more positive note, more recently, with the publication of the National Curriculum Framework (Ministry of Education and Employment, 2012) and

the setting up of the Institute for Education[2] in 2015, this move seems to be regaining the much needed momentum. Indeed, a number of recent initiatives have provided a more active, practice-based, collaborative and on-going approach to CPD – for example: the *Let Me Learn* programme (see Attard Tonna & Calleja, 2010), the *Pestalozzi Action Research* project (see Brown, Gauci, Pulis, Scerri & Vella, 2015), focused training for teachers teaching the core competences learning programmes in Mathematics, Maltese and English, and the *Promoting Inquiry in Mathematics and Science across Europe* (PRIMAS) project.

PRIMAS was an international project within the Seventh Framework Programme of the European Union. Run over four years (2010-2013) in twelve European countries including Malta, the project worked at promoting IBL in mathematics and science. This project, the first of its kind for Maltese teachers, provided a range of CPD materials and ongoing support through school-based communities led by multipliers. Multipliers, who were either practising teachers or teacher educators, led CPD with small groups of teachers (Maaß & Artigue, 2013). In the case of mathematics, five multipliers (a teacher, three heads of department[3] and an education officer), including myself as a head of department, were involved in creating such teacher learning communities in five state secondary schools. Notwithstanding the challenges to implement IBL lessons, Maltese teachers showed a positive orientation towards IBL and reported significantly greater use of IBL in their daily practice (see Engeln, 2013).

Inquiry-based Learning in Mathematics and in CPD

Inquiry is a multifaceted activity (Maaß & Artigue, 2013). More specifically, there seem to be common notions associated with inquiry pedagogies, namely, that they are learner-centred, investigative, problem-oriented, collaborative and question-driven (Goodchild, Fuglestad, & Jaworski, 2013; Jaworski, 2006b; Swan, 2006). In mathematics, IBL is seen to engage learners in thinking, starting off as a mediating tool through the use of tasks and over time shifting to become more "as a way of being" (Jaworski, 2006a, p. 204). The mathematical tasks that teachers use need to provide an "achievable challenge" (see Willis, 2010) requiring students to exert mental effort, but they also need to encourage creativity, decision-making and exploration.

Inquiry is becoming more relevant in the Maltese educational system and mathematics education (Ministry of Education, 2012). In addressing this,

---

[2] Established to provide high quality education through continuing professional development courses to educators at all levels.

[3] Work together with school management teams to ensure high standards in teaching and learning practices.

teachers become key in developing learners' competences and in enabling them to nurture an inquiry stance to learning. This implies that teachers need to develop skills and dispositions to support learners in becoming critical thinkers as well as responsible and active citizens. Teachers may achieve this by undertaking student-centred approaches, and research shows that IBL is an effective way to support building such competences (see Towers, 2010). Through IBL, learning opportunities are aimed towards preparing learners who can create, innovate, collaborate, be critical, explore, communicate and make thoughtful decisions, hence developing key competences and skills crucial to their lives beyond school.

For teachers, using IBL requires what Greeno (2006, p. 543) calls "knowing a conceptual domain", that is, "knowing what resources are available in the domain, knowing where to find them, knowing how to use them, and anticipating the results of using them in different circumstances". Knowing a conceptual domain like IBL implies not just knowing what it means but also how it can be used with learners in different contexts. CPD is hence fundamental in offering teachers with context-related learning opportunities. By immersing participants in the process of inquiry, CPD may provide teachers with modelling experiences of inquiry teaching (Farmer, Gerretson, & Lassak, 2003). A key component of CPD is the role that professional learning tasks play in creating "opportunities for teachers to ponder pedagogical problems and their potential solutions through processes of reflection, knowledge sharing, and knowledge building" (Silver, Clark, & Ghousseini, 2007, p. 262). For learning to occur, CPD is designed to offer teachers opportunities for ongoing collaborative negotiations about the use of IBL in different classroom contexts.

The Study

LTMI is a CPD programme designed as a set of experiences offering teachers opportunities, over one scholastic year, to experience, integrate, reflect upon and develop their inquiry teaching practices. At the time of the study (academic year 2015-16), I was a teacher of mathematics and a head of department in a state secondary school. LTMI, offered to secondary school teachers of mathematics as a voluntary course, was designed as an intervention programme. It was driven and inspired by previous experiences working with teachers and particularly by my passion for designing and leading teacher professional learning. For example, I engaged with teachers at my school in various collaborative projects, such as PRIMAS and the use of formative assessment task. I also regularly contributed to professional development sessions in schools and during mathematics INSET. However, my role in LTMI was related exclusively to design, while teachers and teacher educators with experience in inquiry practices facilitated the sessions with

teachers. My role during these sessions was that of a non-participant observer – collecting feedback to improve the programme in the piloting phase and gathering field notes and other data to study teacher learning during the main phase. For the piloting phase, held during the scholastic year 2014-2015, five teachers took the programme while another 12 teachers enrolled for the main study held the following year.

The CPD Programme

The CPD programme was designed to provide LTMI experiences for teachers first through summer workshops, and then by participating in follow-up meetings held during the scholastic year (see Figure 2). The four summer workshops, led by teachers with experience in inquiry teaching, focused on four IBL features: *mathematical tasks*, *collaborative learning*, *purposeful questioning*, and *student agency and responsibility*. Summer workshops followed a consistent pattern of activities – teachers first worked collaboratively to solve a mathematical task through inquiry, then discussed their experience working on the task and later watched a video from a local classroom demonstrating a teacher using the same task with students. A subsequent activity included the analysis of a published lesson video (available on YouTube) dealing with a particular IBL feature being discussed (e.g., collaborative learning). Discussions alternated between pair, small-group and whole-class. Such discussions were intended as additional opportunities for teachers to further investigate teaching approaches, clarifying concepts and to problematize issues related to teaching through IBL. At the end of each workshop, teachers were encouraged to collaboratively plan a lesson using the activities presented and the ideas generated. The CPD materials are available online and downloadable (see www.iblmaths.com).

Follow-up meetings were then intended to provide collaborative ongoing support for teachers to discuss, evaluate and develop practice-based learning. These meetings followed a structured set of activities led by a facilitator. The opening activity prompted participants to reflect on their inquiry practices. Teachers wrote reflections on sticky notes. Reflections included personal strategies for using IBL, challenging situations encountered and classroom incidents.

This was followed by reporting back and sharing of IBL lessons and tasks. Finally, participants discussed and agreed upon an agenda for the following meeting. The facilitator's role was that of a challenger and an intervener – asking questions to support, stimulate and enable participants' thinking. Over time, this scaffolding was gradually removed to allow for increased teacher autonomy in learning about IBL, but also to nurture a self-sustaining learning

community (see Calleja, 2016 for a more detailed outline of the LTMI activities).

Figure 2: The LTMI programme

SUMMER CPD WORKSHOPS		FOLLOW-UP CPD MEETINGS
A focus on understanding IBL		*Reflecting on classroom practices*
1 Session	**3 Sessions**	**Ten follow-up meetings**
(4 hours)	(4 hours each)	(1¼ hours each)
July 2015	*September 2015*	*October 2015 to May 2016*

The Participants

Seven participants (2 males and 5 females) volunteered to contribute data to my research from a total of twelve participants (5 males and 7 females) joining the LTMI programme. Although I was working with a small number of participants, this sample still included a wide range of participant characteristics (see Figure 3). My aim was to study how IBL was understood, experienced and implemented by teachers with different teaching experience, working in different schools, and teaching different year groups. With this heterogeneous sample, I sought to identify common patterns that captured core experiences of the entire group. According to Patton (2002, p. 235), with a small sample of great diversity, data analysis would "yield important shared patterns that cut across cases and derive their significance from having emerged out of heterogeneity".

Figure 3: Information about the participants

Teacher	School	Prior Knowledge of IBL	Teaching Experience (Years)	Year Group Taught
Sarah	State	PRIMAS	16 – 20	9
Janet	State	None	11 – 15	8
Tania	State	ITE	1 – 5	10
Greta	Church	Course	16 – 20	8
Colin	Church	ITE	1 – 5	9
Chris	Church	ITE	1 – 5	7
Jackie	Independent	None	16 – 20	10

The seven teachers taught mathematics in different secondary schools. There are two types of schools in Malta: state and non-state. State schools are governed by MEDE and operate within colleges consisting of a cluster of primary and secondary schools within particular catchment areas. There are ten of these colleges in Malta each of which is led by a principal. The non-state sector is subdivided into Church and independent Private schools.

Church schools are predominantly Roman Catholic schools heavily subsidized by the government. Private schools are set up by individuals or non-profit parents' foundations that, unlike the other schools, charge tuition fees.

Ethics approval for the research was granted by all these institutions and informed consent was then obtained from all participants and heads of school prior to conducting the research. The study adhered to the ethical principles of informed consent, confidentiality, anonymity and the right to withdraw. Pseudonyms are used to identify the participants in the study (see Figure 3 for data about the participants).

Teachers came into the CPD with different knowledge of IBL. The three younger participants had been exposed to IBL through their Initial Teacher Education (ITE) programmes. Sarah, on the other hand, had participated in the PRIMAS project and also used inquiry in her classroom. Greta had learnt about IBL in her Masters course, while Janet and Jackie were both new to IBL.

Methodology

In undertaking this research, I worked within a qualitative research paradigm with the underlying assumption that understanding of reality is embedded within a social construction (see Guba, 1990). A sound understanding of teacher learning would be gained by studying how teachers operate within the CoP created and cultivated by the CPD, and within their own work-based context.

A data-driven inductive approach (see Boyatzis, 1998) was employed to allow patterns, represented by the voices grounded in the data, to emerge from the 'realities' provided by the seven teachers. The goal was to understand multiple 'realities' across the various data sources from the teachers' perspectives, their experiences and views of effective CPD.

Figure 4: Timeline in using the data collection instruments
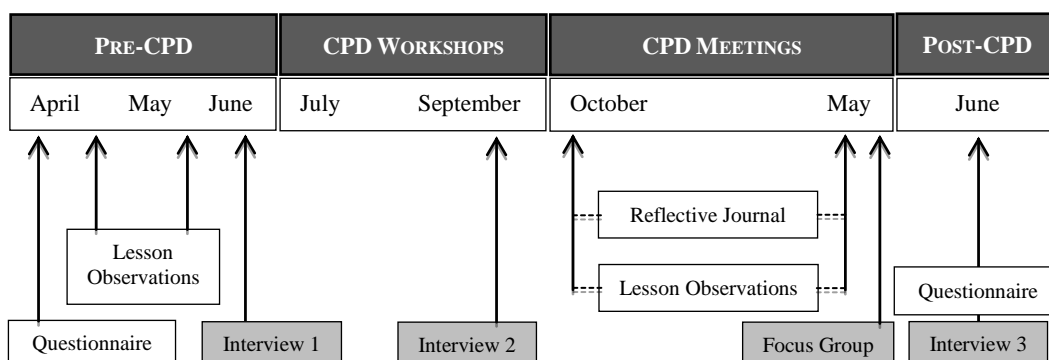
As this was an in-depth study focusing on a small sample of teachers, qualitative methods were chosen to collect data. Five sources were used to gather data from the participants, namely: questionnaires, lesson observations, semi-structured interviews, teacher reflective journals, and a focus group. Figure 4 shows a timeline for collecting data during the study. For the purpose of specifically answering the research questions delineated in this paper, two of these data sources were used: semi-structured interviews and a focus group.

Semi-Structured Interviews

The three semi-structured interviews (see Fontana & Frey, 2000; Kvale, 1996) conducted with the participants before, during and after teacher participation in CPD, focused on gathering data related to practices and knowledge about IBL, and their experiences engaging in CPD. The questions and situations presented touched on all aspects investigated by the research questions. While the first interview addressed aspects linked to motivations for participation, views, practices and knowledge of inquiry, the second interview investigated what participants gained from participating in the CPD workshops, and what they intended to take into their classrooms. The third, and final, interview offered teachers a retrospective, reflective analysis to describe potential challenges and learning experiences encountered in their LTMI journey to make changes towards inquiry teaching. For example, questions in the second and third interview asked participants to describe their experiences and identify LTMI activities that they found most valuable in supporting their professional development. Each interview, which took between 40 to 50 minutes, was audio recorded and later transcribed verbatim.

Focus Group

As a qualitative method for gathering data, the focus group brought together the researcher and the seven participants to discuss their CPD experiences and its effectiveness towards LTMI. Since it was difficult to get participants together at the end of the scholastic year, due to working half-days and the annual examination period, the focus group was held during our last CPD meeting. The focus group participants were led through the discussion by the researcher, acting as a moderator, using questions as probes and prompts for participants to elicit experiences, meanings and insights into effective aspects of the CPD programme. The main advantage of using the focus group was that it offered an opportunity to observe participants as they engaged in discussion about attitudes, perceptions and experiences (Krueger & Casey, 2015) related to their immersion in the CPD programme offered. The focus group took 75 minutes and was video recorded. The video recording was later transcribed for analysis.

Data Analysis

Data analysis was guided by the two research questions and conducted using a thematic approach to analysis and theory (see Braun & Clarke, 2006). Each interview and the focus group transcript were divided into chunks – usually short paragraphs of between 20 to 60 words – applying an open-ended coding technique to label comments and assign codes on the margin. Inductive coding (see Boyatzis, 1998) began with close reading of text and consideration of multiple meanings. Initial codes focused on significant statements, comments and actions that reflected teachers' thoughts, motivations, judgements and expectations of CPD. These codes and comments were then compared and grouped to create themes. The findings reported here consider both unique cases of teachers and the shared motivations and experiences of the participants.

Findings

Teacher Motivations to Participate in the LTMI Programme

In analysing teacher motivations, I examined responses to a question from the first interview specifically asking for their motivations in participating in the LTMI programme. However, teacher motivation also emerged in teacher interactions during the focus group.

Teacher participation in the LTMI programme seemed to be driven by personal motivation factors (McMillan et al., 2014). These teachers demonstrated their personal motivation to engage in CPD, and seemed to view LTMI as a professional and personal development (see Rinaldi, 2006). The reasons that teachers in this study provided as motivations for their participation could be classified into three categories: (1) developing knowledge about teaching; (2) perceived benefits of IBL; and (3) the need to make changes to their classroom practice.

Five of the seven participants claimed that they saw LTMI as an opportunity for them to develop knowledge about teaching. One teacher, referring to a previous experience in the PRIMAS CPD commented:

When we started PRIMAS and inquiry-based learning with the multiplier, I was really interested and wanted to use more of it in my classrooms. When I got to know that this is a similar project, I could not refuse because it is something I am keen about, and in fact, I would like to do more of in my class. (Sarah)

Thus, for Sarah, LTMI offered an opportunity to continue the work she had begun during a previous CPD project. Yet, during the focus group discussion, Sarah communicated an additional motivation claiming "*I had been teaching for a long time and was fed up teaching the same way, sometimes like speaking to the*

wall… I needed something different." It appears that her motivation was not only linked to a desire to continue to develop her knowledge about IBL but also to a change she needed in her teaching. Other participants had similar views related to knowledge development but tended to link their motivations to their perceived benefits that IBL offered.

I believe that new experiences and new learning opportunities motivated my participation. But I also see the benefits of IBL, so if I am to use inquiry in my class I feel I need to be well informed and well taught about the subject. (Colin)

For some of the teachers, LTMI represented a new learning opportunity motivated by the benefits that IBL could offer to their teaching. Another teacher went into more detail to specify why she thought IBL might help and justified why she was interested in taking up CPD.

Some students seem to struggle with learning mathematics, and you hear people saying that changing the pedagogy may help to support these students. So, if these students may get engaged in coming up with their own methods for solving a problem, then mathematics may make more sense to them and be more motivated to at least improve their achievement in mathematics and learn things that they may find useful in life. (Jackie)

For Jackie, the benefits of IBL seemed to arise from the strong position people take when they talk about it. By the word 'people', Jackie was possibly referring to those leading CPD sessions because it is through CPD sessions that she claims to have heard about IBL. Jackie also referred to IBL as promoting a change in pedagogy. For Jackie, it seemed that changing to a more active learning approach may better address the needs of students who are struggling with learning mathematics, and this was her main reason for joining this CPD. This leads to a third aspect emerging from teachers' responses, also linked to an earlier reason given by Sarah – a need for change. Indeed, four of the seven teachers interviewed considered IBL and LTMI as an opportunity for them to shift their pedagogical practices. Together with Jackie, this is how the others saw LTMI:

I think we have so much content to cover. At times, I feel I want to do things differently but I am restricted by the system... this frustrates me a bit. I know there are other possibilities for delivering mathematical content. So, the fact that now I am engaged in a project that may offer a possibility for me to try new things… that encouraged me to take part. (Chris)

I believe students will find mathematics more fun learning through inquiry. I would hence like to vary the kind of lessons I provide my students with and thus making them more interesting for the students. (Greta)

I want to change the way my students learn mathematics – from copying down notes to being more active in participating and constructing knowledge, and the latter is something I am really fond of. (Janet)

For some, LTMI represented an opening and a possibility to use other pedagogies. Like Jackie, Greta and Janet were motivated for change by the fact that they intended to support student learning (see Hunzicker, 2011; Loucks-Horsley et al., 2010), and hence improve the "service that they provide to (their) clients" (Hoyle & John, 1995, p. 17). While Jackie sought to help those falling behind, Greta believed that her students would enjoy learning mathematics through IBL. On the other hand, through IBL, Janet intended to shift the role that her students adopted in class – from passive to active learners. Hence, with the exception of Chris, whose participation in LTMI was motivated by a wish to challenge the system, it seems that for the other teachers, motivations were more directed to addressing student learning by the pedagogical shift that LTMI was offering through IBL.

Teachers' Views of Effective Features of LTMI

In analysing features that teachers viewed as effective within LTMI, I examined responses to questions from the second and third interview, together with the focus group discussion. Teacher responses amounted to 54 separate chunks – 42 emerging from the interviews and 12 from the focus group.

Teachers perceived LTMI as effective in relation to two features: (1) the approach to CPD; and (2) the CoP experience (see Figure 5). The CPD approach adopted by LTMI related to the type of tasks and activities that teachers participated in, the active role undertaken and, those leading and facilitating CPD. The CoP experience related to their lived experience, the shared sense of belonging to a community and the networking generated. It seems that for the teachers these two features of CPD impacted positively on their learning in developing knowledge of IBL, their practice and the changes they implemented. However, the approach to running LTMI as summer workshops appeared to offer a challenge to the learning experience of two teachers who considered the approach to be particularly intensive.

Figure 5: Perceived effectiveness of LTMI on learning about IBL
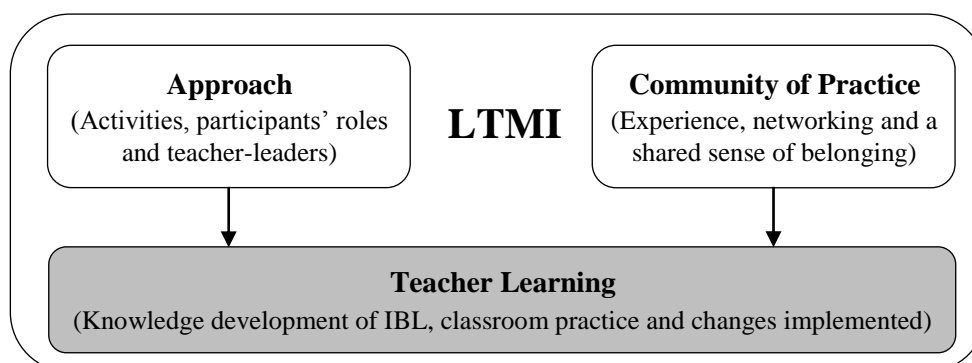
The CPD Approach

Teachers valued the CPD approach adopted, and mentioned various features related to this, namely: the activities, their active role within CPD activities, the shift in role from teachers to students, the modelling of IBL practices and the fact that CPD was led by teachers. The following are excerpts taken from the interviews during which participants spoke about each of these aspects.

Activities: *The session during which we saw one of us teaching a class helped a lot because you learn from the mistakes of others, but also from the positive things. You get ideas and it was surprising to see what a teacher is able to come up with.* (Tania)

Active roles: *I liked taking the role of the student because I could get a first-hand experience and see how it (IBL) works.* (Colin)

Modelling: *I really like the fact that the sessions and the tasks we were presented with mirrored what we can do with our students. I got the message that the session structure provided a model for us of what an IBL lesson should look like.* (Greta)

CPD leaders: *Since the speakers leading the sessions were teachers themselves, I could easily relate it to what they were saying. They spoke about their personal experiences and challenges using IBL, and that helped a lot.* (Janet)

In addition, during the focus group Chris spoke at length on an additional feature that he felt contributed to the effectiveness of his CPD experience.

I think one of the things that helped make this course such a success was that this was not something imposed, but we all seem to be doing this for our own learning and also because we believe in this (IBL). It was not because somebody was checking on me that I did this, but because I wanted to grow as a teacher and for my students to learn… and I think that gives you more motivation, the fact that it is something desirable for us to do...we came to these meetings not because someone forced us to but because we wanted to. I think that made all the difference. This course was something I wished to do...and if there was a time when I could not do as much, there was nothing wrong with that...so I was free...free from the control we spoke about earlier.

Chris experienced a sense of self-directedness but also self-regulation within CPD. Chris engaged in CPD because he chose to and *wanted to grow as a teacher*. He did *something desirable,* and self-regulatory learning enabled Chris to define his own goals for learning (see Butler & Winne, 1995). At the same time, CPD allowed him to be *free from the control* of a system that, he felt, did not trust teachers as professionals. Tania echoed a similar view during the final interview claiming that "*during the follow-up meetings, the topics for discussion were not chosen for us but we were free to decide what was important for us to discuss and learn*".

In all seven cases, teachers linked the approach to CPD adopted as effective towards their knowledge development about IBL or to improved classroom practices. Teachers generally spoke about LTMI effectiveness in terms of increased confidence and motivation in using IBL, benefits in the changes observed when students undertook more active roles, and new ways of learning that they had provided students with.

The CoP Experience

A second important aspect highlighted by teachers related to the CoP created and cultivated within CPD. Teachers attributed CPD effectiveness to the experience, networking and a shared sense of belonging that they experienced through CoP. For teachers, the community represented an opportunity to meet new people, working with teachers from different contexts that brought diverse perspectives, engaging in reflective practice and finding support from the community members.

Experience: *I could see the perspectives of other teachers from outside the small school environment that I work in, and which sometimes makes me feel enclosed within my own self.* (Jackie)

Shared Concerns: *Besides the well-prepared content that we gained a lot from, but to feel that you are in the same boat as the others… that helps. It was one of the positive aspects of the PD.* (Chris)

Reflective Practice: *I understood how important it is for a teacher to reflect on practice. During the meetings, we had opportunities to reflect on what we did in our classrooms. This course provided the space so that participants could reflect.* (Greta)

Collaboration: *I saw it really useful when we planned lessons together because you get the ideas of all members in the group, that provides opportunities to share views because you would not have necessarily thought about these or used such ideas in your practices. I felt that this was always a learning experience because you start considering things that you would perhaps not have thought of before.* (Sarah)

Support: *I was motivated by the fact that I could keep contact with people who value IBL, mainly because I have no-one to work with at my school. The fact that I have people whom to turn to when I have a difficulty, that is of support to me.* (Janet)

Confidence: *Overall I became more confident. Now I know that it is ok when something does not go as planned. During the PD, we saw what*

worked and what did not, so that also gave me the much-needed
confidence when implementing something so new. That, I believe,
also gave me the courage to try. (Tania)

Teachers mentioned aspects related to their sharing of experiences, discussing and addressing common challenges and finding support from colleagues who were *in the same boat*. This brought about a common sense of identity and belonging that supported their professional learning about their IBL practices (Potari, Sakonidis, Chatzigoula, & Manaridis, 2010). Most teachers valued the sharing of concerns and collaboration. Community served as a *support* group because teachers also shared ideas and engaged in collaborative reflections. In the following excerpt taken from the focus group, teachers discuss how the collaborative aspect cultivated within CPD supported their engagement and learning of IBL.

Chris: *I feel this was a course that didn't just speak about theory… on the contrary, we got our hands dirty, we found challenges and difficulties in using IBL, we understood that the challenges we encountered were common to all...and the most precious aspect was that we shared the positives and the negatives.*

Sarah: *Yes, and we also had the opportunity to demonstrate our work.*

Colin: *I had a vague idea about IBL and only knew the method I was trying to implement, the one method that I thought made sense. When I came here I learned about other ideas from my colleagues, I tried them out and saw the results, then came back and picked other ideas always improving on my previous knowledge of inquiry.*

Janet: *Initially I thought I just had to solve one problem (teaching through IBL) yet I found out that this led to other minor challenges that became evident during the follow-up meetings, because we were reflecting more deeply.*

Similar to the findings of the English project RECME (see Back et al., 2009), teachers reported that they valued practical experiences but, more importantly, opportunities to share and demonstrate their work. For most of the teachers, LTMI was effective because of the co-learning opportunities generated by the CoP – learning with and from others, as highlighted by Colin. For others like Janet, the CoP experience helped to uncover and address her ongoing challenges that emerged as a result of her reflective practice. It seems that the CoP contributed significantly towards the effectiveness of LTMI because teachers learnt from getting to know about the teaching methods of colleagues working in different contexts (see Butler et al., 2004; Putman & Borko, 2000). This appears to have provided them with confidence to persist and support in not giving up. Indeed, teachers described both cognitive and behavioural changes – in their knowledge of IBL and how they implemented it in their class.

• • •

However, one aspect of LTMI appeared to be puzzling for two of the participants. Janet and Greta encountered dilemmas during their CPD journey. Janet, for example, was overwhelmed by the content discussed in the summer workshops. During the focus group discussion, she claimed "*Following the summer workshops, I felt lost and couldn't make sense of what an IBL task could be like*". The three-day CPD workshops, held in September, seemed to be too intensive for Janet. She struggled in coming to terms with understanding IBL and, hence, in identifying and choosing tasks for inquiry. The 'block' 12-hour sessions, held just before the scholastic year, appeared to disorient Janet in terms of translating knowledge into practice. Greta who, unlike Janet, had gained prior knowledge of IBL from her Masters course, shared a similar view. She also struggled with understanding what IBL involved and how she could successfully enact it in class. In the interview following her participation in the summer workshops, Greta spoke about this dilemma saying "*I am still unsure whether a task promotes and supports IBL*". Moreover, during the follow-up meetings, she also repeatedly asked the facilitator to explicitly tell her whether a particular task or lesson she was doing could be classified as IBL.

Transferring knowledge from the workshop activities into the classroom is not straightforward (see Stein, Smith, & Silver, 1999). For Greta and Janet, in particular, acquiring a new body of knowledge and skills and developing new habits of practice seemed complex, and the summer workshop structure did not seem to facilitate this. Introducing teachers to new pedagogies (in this case, IBL) and building capacity to understand and enact them requires careful and well-thought designs to professional development programmes, structures and strategies. Using the three-day block INSET days available in July and September was the approach adopted in the LTMI programme. While it offered teachers the 'whole package' of content and the opportunity to learn about IBL before starting the scholastic year, it appeared to deny a more gradual introduction of new material over a longer period of time – at least for these two teachers.

Results and Conclusions

This paper dealt with teachers' motivation to undertake a CPD programme. In addition, it has taken the teachers' voice in developing an understanding of what 'effective' CPD means for these teachers themselves in terms of their experiences, and reactions to the LTMI activities, their learning, and changes in classroom practices. Guskey (2000) argues that factors that motivate teachers in their practice need attention in bringing about changes in classroom practices through professional development. In other words, professional developers need to consider teachers' motivation, reasons and

needs for participation, and address these within their designs.

In Malta, participation in CPD may occasionally turn out to be an individual teacher's decision to attend a voluntary course. This decision rests on a number of motivations. Teachers in this study chose to participate in LTMI for three main reasons: (1) to develop their knowledge of IBL; (2) their beliefs about the benefits of teaching through IBL; and (3) the need to change their practices. Such findings are also reported in other studies (Anderson, 2008; Back et al., 2009). These motivations are rather personal and intrinsically motivated. The teachers participating in this study, sought to improve their knowledge and change their practices not because it was imposed on them, but as a result of their preconceptions of what IBL could provide in terms of knowledge about teaching mathematics.

The CPD programme design recognized the situative perspective (Lave & Wenger, 1991) in the process of LTMI. Lave and Wenger (1991, p. 98) view a CoP as "a set of relationships among persons, activity, and world over time". Two aspects of this theory emerge as relevant to CPD: (1) teachers' learning is enhanced by their participation in a CoP where they are supported by other members of that community; and (2) teacher implementation of reform is supported by practice-based experiences over a period of time. These two aspects resonate well with the findings arising from this study. Teachers' views of what makes LTMI 'effective' can be categorised under two aspects: the CPD approach and the CoP experience. Data indicated that teachers valued participation within a CPD approach that promoted an immersion in active learning that was hands-on, self-directed, self-regulated and involved a reflective engagement for learning. This was indeed sustained by a community that provided teachers with a shared sense of belonging to a CoP that was supportive.

The data also suggests that when CPD is designed with an approach that values and respects teachers' knowledge, when teachers are active learners and free to use the knowledge gained at their own pace (O'Sullivan & Deglau, 2006), their experience is likely to be a positive one. Teachers also indicated the modelling of IBL as effective towards their understanding and learning of teaching through inquiry. Farmer et al. (2003) argued for modelling learner-centred CPD materials as this enabled the teachers in their study to embrace new ways of teaching and integrate them into their professional practices. Four common recommendations for effective CPD include a focus on mathematical content, the use of activities that actively engage teachers in learning, planning for sustained time to learn, and developing a CoP (Garet et al., 2001; Guskey, 2000). These features of CPD are aligned to the responses teachers in this study gave related to their experiences contributing to making LTMI effective. Data suggested that teachers view LTMI as effective when it has collective participation of teachers from different schools. An added

source of learning for teachers was their reflective practice especially when carried out with others and over a prolonged period of time. Teacher empowerment is seen to stem from such prolonged engagement in social interaction. As the cases of Sarah and Chris show, teachers started to build confidence and see themselves as making personal contributions to knowledge development. Yet, particularly in the initial phase of LTMI, Greta and Janet struggled with their development of IBL. The summer workshop structure adopted appeared intensive for them and did not facilitate the gradual introduction of new material.

This paper contributes to knowledge by focusing on the LTMI learning experiences of teachers. CPD is usually designed to stimulate change from old ways of working to new and unfamiliar practices. Just like students, teachers need to be supported to learn new knowledge (Mansour et al., 2014). The evidence-based argument in this paper, stemming from the theoretical position it has taken, is that teacher learning is best 'enabled' through long term, ongoing, practice-based, self-regulated and CoP oriented CPD, in which reflective practice and networking are at the heart of the programme. Yet, addressing this implies rethinking the way CPD is planned. Bubb and Earley (2013) argue that we need not necessarily find more time but instead make better use of the time available for professional development. While using time effectively to address issues that matter for teachers is important, the argument I make here changes the focus towards *making time for collaboration*.

For the seven Maltese teachers in the study, their ongoing interaction with other colleagues to discuss their work and that of their students was key to them in developing and sustaining deeper practice-based understandings of IBL. Making time for collaboration, an important characteristic of high-quality CPD (O'Sullivan & Deglau, 2006), implies rethinking structures that provide teachers with on-the-job opportunities to meet, share, discuss and learn from one another. In Malta, but also in other countries like England and Norway (see Bubb & Earley, 2013) teachers have specific time allotted for their professional development – during and after school hours, and during training days when schools are closed for students (INSET days). However, these statutory training periods appear to offer limited opportunities for teachers to meet on a regular basis. Professional development time needs to be embedded within teachers' practice on a weekly basis – it needs to address a cultural shift in teacher learning that involves careful design, support structure and time (Stein et al., 1999). Making time for collaboration entails empowering teachers to take personal initiative in identifying needs and working with others to address these. But, more importantly, making time for collaboration requires a supportive climate (Fullan, 1993) where environments and support structures assist and motivate teachers to learn at their own pace in unhurried and non-threatening ways.

Acknowledgement

References

Anderson, J. (2008) Teachers' motivation to attend voluntary professional development in K-10 mathematics. In M. Goos, R. Brown, & K. Makar (Eds.), *Proceedings of the 31st Annual Conference of the Mathematics Education Research Group of Australasia* (pp. 51-58). .

Anderson, R. D. (1996) *Study of Curriculum Reform*. Washington, DC: U.S. Government Printing Office.

Attard, K. (2012) Public reflection within learning communities: an incessant type of professional development. *European Journal of Teacher Education, 35*(2), 199-211.

Attard Tonna, M., & Calleja, C. (2010) The Let Me Learn Professional Learning Process Experience: A New Culture for Professional Learning. *Universitas tarraconensis: Revista de ciències de l'educació, 1*, 35-54.

Back, J., Hirst, C., De Geest, E., Joubert, M., & Sutherland, R. (2009) *Final Report: Researching effective CPD in mathematics education*. UK: NCETM.

Bassett-Jones, N., & Lloyd, G. (2005) Does Herzberg's motivation theory have staying power? *Journal of Management Development, 24*(10), 929-943.

Bezzina, C. (2002) Rethinking teachers' professional development in Malta: Agenda for the twenty-first century. *Journal of In-Service Education, 28*(1), 57-78.

Bezzina, C. (2006) "The Road Less Traveled": Professional communities in secondary schools. *Theory and Practice, 45*(2), 159-167.

Boyatzis, R. (1998) *Transforming Qualitiative Information: Thematic analysis and code development*. Thousand Oaks, CA: Sage.

Braun, V., & Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101.

Brown, M., Gauci, P., Pulis, A., Scerri, R., & Vella, C. (2015) Professional Development of Teachers at Malta's Giovanni Curmi Higher Secondary School: Contributions from a stake-holding think tank. *Malta Review of Educational Research, 9*(1), 137-170.

Brown, S., Collins, A., & Duguid, P. (1989) Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 32-42.

Brown, S., & McIntyre, D. (1993) *Making Sense of Teaching*. Buckingham: Open University Press.

Bruder, R., & Prescott, A. (2013) Research evidence on the benefits of IBL. *ZDM Mathematics Education, 45*(6), 811-822.

Bubb, S., & Earley, P. (2013) The use of training days: Finding time for teachers' professional development. *Educational Research, 55*(3), 236-248.

Butler, D. L., Novak Lauscher, H., Jarvis-Selinger, S., & Beckingham, B. (2004) Collaboration and self-regulation in teachers' professional dvelopment. *Teaching and Teacher Education, 20*, 435-455.

Butler, D. L., & Winne, P. H. (1995) Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research, 65*, 245-281.

Calleja, J. (2016) Teaching Mathematics through Inquiry: A continuing professional development programme design. *Educational Designer, 3*(9). Retrieved from http://www.educationaldesigner.org/ed/volume3/issue9/article30/

Chin, E., & Lin, F. (2013) A survey of the practice of a large-scale implementation of inquiry-based mathematics teaching: from Taiwan's perspective. *ZDM Mathematics Education, 45*, 919-923.

Coburn, C. E., & Stein, M. K. (2006) Communities of practice theory and the role of teacher professional community in policy implementation. In M. I. Honig (Ed.), *New Directions in Education Policy Implementation: Confronting Complexity* (pp. 25-46). Albany, USA: State University of New York Press.

DuFour, R. (2004) What is a 'professional learning community'? *Educational Leadership, 61*(8), 6-11.

Earley, P., & Bubb, S. (2004) *Leading and Managing Continuing Professional Development: Developing people, developing schools* (Vol. A). London: Paul Chapman.

Engeln, K. (2013) *IBL implementation survey report.* Retrieved from http://www.primas-project.eu/

Engeln, K., Mikelskis-Seifert, S., & Euler, M. (2014) Inquiry-based mathematics and science education across Europe: A synopsis of various approaches and their potentials. In C. Bruguière, A. Tiberghein, & P. Clément (Eds.), *Topics and Trends in Current Science Education*. Netherlands: Springer.

Farmer, J., Gerretson, H., & Lassak, M. (2003) What teachers take from professional development: Cases and implications. *Journal of Mathematics Teacher Education, 6*(4), 331-360.

Fontana, F., & Frey, J. (2000) The interview: From structured questions to negotiated text. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of Qualitative Research* (pp. 645-672). Thousand Oaks, CA: Sage.

Fullan, M. G. (1993) Why teachers must become change agents. *Educational Leadership, 50*(6), 12-17.

Garet, M., Porter, A., Desimone, L., Birman, B., & Yoon, K. (2001) What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38*(4), 915-945.

Goodchild, S., Fuglestad, A. B., & Jaworski, B. (2013) Critical alignment in inquiry-based practice in developing mathematics teaching. *Educational Studies in Mathematics, 84*(3), 393-412.

Greeno, J. G. (2006) Authoritative, accountable positioning and connected, general knowing: Progressive themes in understanding transfer. *Journal of the Learning Sciences, 15*(4), 537-547.

Guba, E. G. (1990) *The Paradigm Dialog*. Newbury Park: Sage.

Guskey, T. R. (2000) *Evaluating Professional Development*. Thousand Oaks: Corwin Press.

Guskey, T. R. (2002) Professional development and teacher change. *Teachers and Teaching: Theory and Practice, 8*(3/4), 381-391.

Hoyle, E., & John, P. D. (1995) *Professional Knowledge and Professional Practice*. London: Cassell.

Hunzicker, J. (2011) Effective professional development for teachers: A checklist. *Professional Development in Education, 37*(2), 177-179.

Ireland, J. E., Watters, J. J., Brownlee, J., & Lupton, M. (2012) Elementary teacher's conceptions of inquiry teaching: Messages for teacher development. *Journal of Science Teacher Education, 23*(2), 159-175.

Jaworski, B. (2006a) Developmental research in mathematics teaching and learning: Developing learning communities based on inquiry and design. In P. Liljedahl (Ed.), *2006 Annual Meeting of the Canadian Mathematics Education Study Group* (pp. 3-16). Calgary, Canada: University of Calgary.

Jaworski, B. (2006b) Theory and practice in mathematic teaching development: Critical inquiry as a mode of learning in teaching. *Journal of Mathematics Teacher Education, 9*(2), 187-211.

Jaworski, B. (2007) Theory in developmental research in mathematics teaching and learning: Social practice theory and community of inquiry as analytical tools. *Proceedings of the 5th Congress of the European Society for Research in Mathematics Education*. Cyprus: Department of Education, University of Cyprus.

Joubert, M., & Sutherland, R. (2008) *A perspective on the literature: CPD for teachers of mathematics*. UK: NCETM.

Joubert, M., Sutherland, R., Back, J., De Geest, E., & Hirst, C. (2008) How do teachers of mathematics understand 'effective' CPD? In M. Joubert (Ed.), *Proceedings of the British Society for Research into Learning Mathematics*. King's College, London.

Krueger, R. A., & Casey, M. A. (2015) *Focus Groups: A practical guide for applied research* (5th ed.). USA: SAGE Publications.

Kvale, S. (1996) *Interviews: An Introduction to Qualitative Research Interviewing*. Thousand Oaks, CA: Sage.

Lave, J., & Wenger, E. (1991) *Situated Learning: Legitimate Peripheral Participation*. Cambridge, UK: Cambridge University Press.

Little, J. W. (1993) Teachers' professional development in a climate of educational reform. *Educational Evaluation and Policy Analysis, 15*, 129-151.

Loucks-Horsley, S., Stiles, K., Mundry, S., Love, N., & Hewson, P. (2010) *Designing Professional Development for Teachers of Science and Mathematics* (3rd ed.). Thousand Oaks, CA: Corwin.

Maaß, K., & Artigue, M. (2013) Implementation of inquiry-based learning in day-to-day teaching: A synthesis. *ZDM Mathematics Education, 45*(6), 779-795.

Mansour, N., Albalawi, A., & Macleod, F. (2014) Mathematics teachers' views on CPD provision and the impact on their professional practice. *Eurasia Journal of Mathematics, Science and Technology Education, 10*(2), 101-114.

McMillan, D. J., McConnell, B., & O'Sullivan, H. (2014) Continuing professional development - why bother? Perceptions and motivations of teachers in Ireland. *Professional Development in Education, 42*(1), 150-167.

Ministry of Education. (1999) *Creating the Future Together: National Minimum Curriculum*. Malta: Ministry of Education.

Ministry of Education. (2012) *Handbook for the Teaching of Mathematics*. Malta: Curriculum Management and eLearning Department.

Ministry of Education and Employment. (2012) *A National Curriculum Framework for All*. Malta: Salesian Press.

Ng, C. (2010) Do career goals promote continuous learning among practicing teachers? *Teachers and Teaching, 16*(4), 397-422.

O'Sullivan, M., & Deglau, D. (2006) Principles of Professional Development. *Journal of Teaching in Physical Education, 25*, 441-449.

OECD. (2009) *Creating effective teaching and learning environments: First results from TALIS*. Paris: OECD.

Patton, M. Q. (2002) *Qualitative Research and Evaluation* (3rd ed.). Thousand Oaks, CA: Sage.

Potari, D., Sakonidis, H., Chatzigoula, R., & Manaridis, A. (2010) Teachers' and researchers' collaboration in analysing mathematics teaching: a context for professional reflection and development. *Journal of Mathematics Teacher Education, 13*, 473-485.

Putman, R. T., & Borko, H. (2000) What do new views of knowledge and thinking have to say about research on teacher learning? *Educational Researcher, 29*(1), 4-15.

Rinaldi, C. (2006) *In dialogue with Reggio Emilia: Listening, researching and learning*. London: Routledge.

Silver, E. A., Clark, L. M., & Ghousseini, H. N. (2007) Where is the mathematics? Examining teachers' mathematical learning opportunities in practice-based professional learning tasks. *Journal of Mathematics Teacher Education, 10*, 261-277.

Stein, M. K., Smith, M. S., & Silver, E. A. (1999) The development of professional developers: Learning to assist teachers in new settings in new ways. *Harvard Educational Review, 69*(3), 237-269.

Swan, M. (2006) *Collaborative Learning in Mathematics: A Challenge to our beliefs and practices*. London, England: National Institute for Advanced and Continuing Education (NIACE) National Research and Development Centre for Adult Literacy and Numeracy (NRDC).

Towers, J. (2010) Learning to teach mathematics through inquiry: A focus on the relationship between describing and enacting inquiry-oriented teaching. *Journal of Mathematics Teacher Education, 13*, 243-263.

Van Eekelen, I. M., Vermunt, J. D., & Boshuizen, H. P. A. (2006) Exploring teachers' will to learn. *Teaching and Teacher Education, 22*, 408-423.

Watson, C. (2014) Effective professional learning communities? The possibilities for teachers as agents of change in schools. *British Educational Research Journal, 40*(1), 18-29.

Wenger, E. (1998) *Communities of Practice: Learning, meaning and identity*. Cambridge, MA: Cambridge University Press.

Willis, J. (2010) *Learning to Love Math: Teaching strategies that change student attitudes and get results*. Alexandria, Virginia: ASCD.