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**A Study on the Perceptions of UAE Private Secondary  
School Mathematics Teachers on the Impact of CPD  
Program Improvement**

دراسة حول مفاهيم معلمي الرياضيات الثانوي عن تأثير برنامج التطوير  
المهني

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## Abstract

Continuous professional development (CPD) comprises a range of learning activities that allow professionals to continue to learn and develop throughout their careers. The growing demand for better improvement in mathematics education and students' achievement calls for effective CPD. Mathematics teachers need effective CPD programs or activities that enhance their skills and trains them to set high expectations for their students. This study explores secondary mathematics teachers' perceptions of the impact of conducted CPD program on improving their teaching strategies in implementing the new mathematics curriculum in a private school in Dubai, UAE. A mixed methods approach was used with both quantitative and qualitative methods. The instruments used are the secondary mathematics teacher feedback form (SMTFF), teachers' reflective journals and interview forms. Participants' responses revealed that collaboration between teachers and relevance of promoted content should be the main focus of any CPD program.

The implications from these key findings explore how different contributions such as continuity and collaboration can be developed to make CPD programs more efficient and relevant. Throughout the study the constant issue that emerged was the need for a paradigm shift in CPD content and methods of delivery to insure that attendees are leaving CPD sessions with useful ideas and activities that are applicable inside their classrooms.

**Keywords: Continuous Professional Development (CPD), collaboration, teacher perceptions, teaching strategies.**

التطوير المهني المستمر (CPD) هو مجموعة من الأنشطة التي تسمح للمهنيين مواصلة التعلّم وتطوير خبراتهم ومهاراتهم طوال فترة حياتهم المهنية في مجال التعليم والتعلّم.

وإنّ الطلب المتزايد والضرورة الملحة لتحسين تعليم الرياضيات للارتقاء بتحصيل الطلبة يدعو إلى برنامج التطوير المهني المستمر (CPD) الفعال.

فمعلمو الرياضيات يحتاجون إلى هذا التطوير الفعال الذي يعزز مهاراتهم ليرفعوا بذلك سقف توقعاتهم تجاه طلبتهم .

تبحث هذه الدراسة تصوّرات معلمي الرياضيات للمرحلة الثانوية وتأثير برنامج (CPD) في تحسين استراتيجيات تدريس وتنفيذ مناهج الرياضيات الجديدة في مدارس دبي الخاصة في دولة الإمارات العربية المتحدة .

هذا وقد مزجت هذه الدراسة بين الأنماط والأساليب المستخدمة من حيث النوع والكم على حدّ سواء ، والوثائق التي من شأنها إنجاح هذه الورشة هي استمارة تقييم لورشة العمل من قبل مدرسي الرياضيات للمرحلة الثانوية ، بالإضافة إلى استمارة لتقييم ورشة العمل ذاتياً يحتفظ بها المدرس المشارك ، فضلاً عن النموذج الذي تنتمّ العودة إليه في مقابلات لاحقة تُجرى مع المدرس الذي حضر الورشة ، إنّ ردود فعل المشاركين من خلال ما سبق يوضح بأن التفاعل بين المشتركين وارتباط مضمون ورشة العمل باحتياجاتهم المهنية هي النقطة الأهم في أي برنامج تطویر .

إنّ الآثار المترتبة عن نتائج هذه الدراسة تكشف كيف أنّ مجموعة المساهمات المختلفة فضلاً عن الاستمرارية والتعاون يمكن تطويرها لجعل برنامج (CPD) أكثر كفاءة وذو صلة بالواقع .

وطوال فترة الدراسة تطلّ القضية الملحة الواضحة هي الحاجة الضرورية إلى نقلة نوعية في محتوى (CPD) والتأكيد على أنّ من حضروا هذا البرنامج غادروا الجلسات وبحوزتهم الأفكار والأنشطة المفيدة التي يمكنهم تطبيقها داخل فصولهم الدراسية

كلمات البحث : التطوير المهني المستمر (CPD) ، التعاون ، تصورات المعلمين ، استراتيجيات التدريس .

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## **Chapter One: Introduction**

The world is changing rapidly in everyday life. Some of the changes in the world include implications of globalization, technological advancements, workforce diversity, labour shortages, changing skill requirements, the contingent workforce, and new methodologies. Ifanti and Fotopoulou (2011), Webb, Maliao and Siar (2004), and Hargreaves (2000) state that the rapid economic and social changes certainly penetrate every sector including education which resulted in changes and innovations in all systems from all over the world. Today's educational climate and the exponential growth in technology with its effect on the economy and society are constantly varying. Those variations affect all stakeholders and result in different teaching and learning practices. Herrity and Morales (2004) state that schools are facing dynamic, and complex changes and challenges nowadays. Ifanti and Fotopoulou (2011) also claim that schools and consequently teachers face a broad spectrum of changes and reforms which affects their roles and responsibilities and raises the standards and demands. However, regardless of these global variations, schools are expected to maintain excellence in their students' attainments. Clement and Vandenberghe (2003) emphasize that schools and school leaders are under growing demand to deliver high quality education. Teachers are the most significant component in the school system. They play a key role in the excellence or failure of a school system. Hartsell, Herrison, Fang and Rathod (2009) insist that effectiveness of an educational organization and students' achievements originate from the teacher. Teachers' roles have witnessed a paradigm shift from being followers to becoming leaders. Well-qualified teachers are the drivers who can plant the right seeds in the growing generation to solve global issues. As recently stated by the Organisation for Economic Co-operation and Development (OECD (2009), the quality of teaching does make a difference to student learning. Khan and Chishti (2012, p.88) state that nowadays quality education is needed and only quality teachers can guarantee that. In this context, the researcher designed and delivered a continuing professional development program to increase the qualification of secondary mathematics teachers who were expected to apply the new strategies based on the school improvement plan.

Global innovations demand a continuous improvement in all career fields, and especially in the teaching profession. Boudah, Logan and Greenwood (2001) call for the need for teachers to restructure their professional practices and expand their education. Supporting this claim, Ozdemir (2013) states that a teacher who cannot continuously improve and develop ends up with obsolete knowledge and instructional skills. Training teachers towards empowerment is essential to enable them to maintain a job and income. Providing professional development opportunities for teachers is the ultimate rewarding investment for school. Getenet, Trimble and Nailon (2013) insist that professional development is a crucial element for improving the quality of educational practice for school leaders and education professionals, not only teachers and their teaching. Lee and Shiu (2008) view continuing professional development as an integral part of school development. Professional development is an essential factor for maintaining high quality teaching and learning. Harris and Muijs (2005) believe that empowerment of teachers is essential nowadays to achieve distributed leadership. In supporting this viewpoint, Makori and Onderi (2013) feel that effective training improve teachers' performance and makes them positive determinant factors in students' academic achievements and active performers in their school. A considerable part of the research study has focused on the factors which affect secondary mathematics teachers' professionalism, professional development and their formation.

## **1.1 Background**

Many scholars have defined teacher professional development (PD) but there is still a lack of consensus among them. Most of the literature reviewed (Bloom, 2002; Gabriel, Day & Allington, 2011; Guskey, 2000) described teachers' professional development as an intentional, systematic and ongoing process of formal and informal educational, training, learning and support activities. Talevski, Janusheva and Pejchinovska (2011) define professional development as a learning experience or planned activity that is beneficial for teachers and which improves the quality of teaching, and consequently contributes to students' achievement as well as the overall atmosphere in schools. Hawley and Valli (1999) confirm that professional development can take place in either external or work-based settings. Many researchers (Desimone, 2009; Garet et al., 2001; Elmore & Burney, 1999; Fishman, Marx, Best & Tal, 2003; Guskey, 2002) insist that any

successful implementation of educational reformation is dependent on teachers' professional development. Talevski et al. (2011) contend that school reforms cannot justify their purpose without an effective professional development program. In the same vein, Hartsell et al. (2009) argue that professional development is a critical key factor that enables institutions to become successful in instruction particularly in mathematics education. Mathematics achievements and the quality of mathematics teaching is a major focus area in school reformation due to the performance in international achievement tests such as TIMSS and PISA. Merrill, Devine, Brown and Brown (2010) state that the ultimate goal of a school is to improve student learning in mathematics. In specific, reforms in mathematics education call for employing teaching methodologies and assessment strategies through providing professional development programs that meet teachers' needs. Fullan and Mascal (2000) also contend that professional development is the key to successful reformation as it links ongoing learning of individuals to school improvement and program implementation.

Professional development aims to improve the mechanism of instruction which yields improvement in students' learning. Khan and Chishti (2012) state that teacher training enables teachers to select the right method according to the demand of the topic which helps create a good learning environment and decreases short comings in the teaching and learning process. Professional development in the field of teaching of mathematics has specific goals and characteristics that focus mainly on mathematical knowledge, methodologies of teaching and pedagogical strategies. Khan and Chishti (2012) affirm that staff development is a process that enhances staff capabilities in terms of pedagogical skills and content knowledge.

Most studies in the area (e.g. Ball & Cohen, 1999; Borko, 2004; Hawley & Valli, 1999; Ifanti and Fotopoulou, 2011; McGee, Wang and Polly, 2013; Putnam & Borko, 2000; Thompson & Zeuli, 1999; Wilson & Berne, 1999) show that analyses of mathematics knowledge for teaching and how it develops have influenced the design of mathematics professional development. Doerr and English (2006) argue that lack of mathematical content knowledge prevents teachers from being able to analyze students' mathematical thinking. Hunting and Doig (1997) feel that solid mathematical content knowledge enables teachers to design actions that respond to students' understanding.

McGee et al. (2013) insist that enhancing mathematics knowledge and pedagogies is one way to improve students' mathematical learning. Prendergast and O'Donoghue (2014) state that effective mathematics teachers exercise a wholesome and inspiring influence on their students. Effective mathematics teachers use different teaching pedagogies to deliver the subject content which allows students to excel in their learning. De Vita, Verschaffel and Elen (2014) insist that in mathematics education, the usage of multiple representations and different methodologies to deliver the content is a component in mathematical thinking, learning and problem solving. Effective professional development programs have the potential of providing teachers with learning opportunities to increase their knowledge and skills.

Continuous professional development (CPD) is the range of learning activities that allow professionals to continue to earn and develop throughout their careers. Khan (2012, p.37) defines CPD as a "conscious updating" of professional knowledge and the improvement of professional competence throughout person's working life. Opfer and Pedder (2010) state that CPD provision is based on involving teachers in active forms of learning to enhance their competencies by linking it to their classroom teaching and learning experience. CPD is the means by which professionals keep their skills and knowledge up to date. It is a process of lifelong learning which enables teachers to expand their knowledge, share their best practices, and enhance their skills to fulfill their potential. Lessing and De Witt (2007) insist that CPD should provide teachers with an opportunity to apply newly acquired knowledge in practice. The main parties in this process are the trainer and the trainees. CPD connects people to expose them to discuss common interests. Attendees will arrive at a common understanding to reach higher purposes. They will usually leave a CPD convinced that there is a fundamental need to do something different. Mansour, Albalawi and McLeod (2014) state that CPD is a process that stimulates change from old and familiar ways of working to new and innovative practices. The gathering of teachers and educators is an opportunity to share ideas and reach agreeable conclusions that best serve their students. Buczynski and Hansen (2010) argue that PD is efficient only when teachers practice their professional experiences.

## **1.2 The Rationale for the Study**

In Dubai, the turnover rate is very high in most occupations. In particular, the school selected for this study has resignation numbers among teachers that are very high. The turnover rate varies from 30% to 47% annually. The school needs to maintain good performance and blend new teachers in their current community. Regardless of the high turnover, the school needs to maintain best practices and accommodate KHDA's recommendations based on their annual inspection visits. PD is one of the most important strategies that help private schools to address the issues mentioned above. Professional development is a means to unite the different visions and backgrounds of teachers to establish a learning environment that works in harmony to accomplish the school improvement plans. Lee and Shiu (2008) affirm that CPD is an integral part of school development. The agenda of the PD is usually designed based on the development plan of the school. Internal PD at this private school is either induction programs for new teachers or workshops for all teachers. Current teachers need professional support to improve their practice and to stay up-to-date with the new innovations in education while the orientation for the new teachers will make their transition to the new school smooth and effective. Such programs act as a facility tool that supports them to adapt and blend in the new environment.

Being head of curriculum development and trainer in a management company in Dubai, the researcher aims to help teachers develop their skills as lifelong learners and provide them with the essentials through designing, delivering and implementing PD programs. Throughout my career my main concern was related to the effectiveness of the PD and the teachers' perceptions of the PD features and content relevance. My strong interest in CPD and teachers' perceptions of CPD makes this research a great opportunity for me to reflect on current practices as an academic director.

## **1.3 Purpose of the Study**

This dissertation study aims to investigate the perceptions of secondary mathematics teachers regarding the CPD program conducted to implement a new mathematics

curriculum in a private school in Dubai. Although CPD can take the form of informal workshops and formal learning, the focus of this dissertation is formal learning.

The purpose of this study is to investigate secondary mathematics teachers' perceptions of the effectiveness of CPD.

The purpose will be realized through the following research questions:

1- What are secondary mathematics teachers' perceptions of the impact of the CPD on their teaching practices?

2-What are the key features of a successful CPD program for secondary mathematics teachers?

Thus, the main concern of this study was to establish what happens after the continuous professional development program. When the sessions are over, it is assumed that participants leave the venues with useful ideas. It is assumed that they will process the information and relate it to their daily professional practices and experiences in their classrooms. Participants will start preparing to implement the new practices at this stage. Many scenarios can result after the continuous professional development program is conducted. Firstly, teachers can benefit tremendously and become more skillful in classes. Secondly, they can benefit tremendously but remain the same in their classes. Lastly, they can see no benefit at all and go back to their classes and resume the same methods. Based on the researcher's experience, most teachers see no connection between their continuous professional development program and everyday classroom needs. Teachers have a negative perception about the impact of CPD program experience. They see themselves as passive learners who are engaged in sessions that are irrelevant for them. They are conservative when asked to evaluate the CPD sessions because they feel that their feedback does not affect the structure and content. They have lost faith in the effectiveness of CPD programs due to the limited support after CPD programs from school leaders. The lack of follow-up support and assistance causes depression for the enthusiastic participants who are eager to move forward. Studies have found that new concepts and strategies are rarely transferred to classroom practice.

## **1.4 Significance of Research**

PD is an important area of research at many different levels. Some focus on features of design of content, or duration of program, while others focus on impact of the content on classroom practices. However, the effectiveness of PD experience and its impact on teaching practices are continuously researched areas. Fishman et al. (2003) claim that continuous research on teachers' professional development will help create a knowledge base that links PD forms to effective teacher learning. Gunnarsdottir (2014) states that a central issue in educational debates nowadays is the development opportunities provided to teachers to learn and develop their professional knowledge.

The content of CPD program conducted for this research study was designed based on teachers' prior knowledge although it has a top down CPD delivery approach. Sabah, Fayez, Alshamrani and Mansour (2014) argue that top down CPD delivery approaches prevent teachers from being recognized as a source of critical and reflective practice. Sabah et al. (2014) further stress on the importance of collecting information about teachers' needs in the planning process of CPD. Wood et al. (2011) state that understanding the needs of teachers in higher education and guiding their professional learning is essential.

This research study is not just aiming to investigate the features of the CPD and the delivery process but also evaluates the impact of the delivered CPD content on the quality of teachers' practices in a private school in Dubai, the UAE. Sabah et al. (2014) insist that seeking to organize a professional development program is insignificant unless it is accompanied with successful implementation efforts and clear evidence of their effectiveness.

## **1.5 Structure of Dissertation**

This chapter has outlined the topic, purpose, questions, and rationale of the study, and provided the background, context, significance, objectives of research as well as the research questions. Next, chapter two provides a review of literature and theoretical framework from the international context. This chapter looks at the historical overview of



PD and the development of CPD. It also discusses the significance of CPD on teaching profession and the notion of teacher professionalism. Many themes emerged from the literature reviewed such as the changing paradigm of CPD, impact of CPD on teaching practices, core features of effective CPD, secondary math teaching pedagogies and methodologies.

Chapter three describes the research methodology and specifies the research instruments used for data collection. It includes details related to context, CPD design and context, research instruments, data analysis procedure, reliability and validity of data as well as ethical considerations. Chapter four outlines the data analysis and findings of the study. It also includes the discussion of the key findings which are integrated with the literature reviewed in chapter two. Finally, chapter five presents the conclusions and suggested recommendations as well as the barriers that affected this study's outcomes.

## **Chapter Two: Literature Review and Theoretical Framework**

This chapter provides the theoretical framework and review of pertinent bodies of literature and studies on teachers' continuous professional development. It presents the trends of CPD approaches in the educational sector and discusses its impact on teaching profession. Several themes emerged from the literature reviewed that are related to the research questions and the content of the conducted CPD program such as definition of teachers' CPD, the impact of CPD on teaching profession, trends of CPD approaches in educational sector, and impact of CPD programs on improving teaching and learning. This chapter also explores CPD programs catering for the needs of teachers and schools, impact of CPD programs on educational reformation as a result of responding to Globalization, trends of CPD approaches in the educational sector, teacher experience and perceptions of CPD , and core features of effective CPD.

### **2.1 Definition of Teachers' CPD**

There are various definitions for CPD from a range of different educational traditions and contexts. Day (1999) stated that PD is a bundle of natural learning experiences and planned activities which are beneficial to individuals and contribute to the quality of education in the classroom. Galloway (2000, in Goodall et al., 2005, p. 26) further elaborated on the above that:

The concept [of CPD] is often left ill-defined being in many cases conflated with the related concepts of in-service training and on the job learning. Both are more limited than CPD, as CPD can encompass a wide variety of approaches and teaching and learning styles in a variety of settings (inside or outside of the workplace). It is distinguishable from the broader concept of lifelong learning, which can include all sorts of learning. It is seen primarily as being related to people's professional identities and roles and the goals of the organization they are working for.

CPD is widely found in the literature published after 2000. Earley and Bubb (2004) stated that CPD stands for ongoing education and training for the professions. Roga

and Grayson (2003) described teachers' CPD as a process embracing activities that enhance their professional career growth. Curtis and Cheng (2001) stated that the term "continuing" is used to describe PD as being ongoing, lifelong oriented and connected in the process of "ongoing" change process. Talevski et al. (2011, p.46) further explained PD as:

The term professional development of teachers involves all learning experiences and all planned activities which are beneficial to the teachers and which contribute to improvement of students' achievement, improvement of the quality of the work of teachers and the overall atmosphere in schools.

Building on the above meanings, Khan and Chishti (2012) state that CPD is a process of enhancing capabilities of the staff in terms of pedagogical skills and knowledge. In the same light, Mansour et al. (2014) define CPD as a simulator that changes old and familiar ways of work to new and unfamiliar practices. In this study, in spite of the literature reviewed, CPD is defined as activities that have a positive impact on teaching proficiency, pedagogies, methodologies and curriculum as well as developing a sense of commitment between teachers and students to affect students' achievements.

## **2.2 Impact of CPD Programs on Improving Teaching and Learning**

Educational experts (Hargreaves, 1994; Day, 1999) have consistently shown that CPD is an essential component of successful educational and school change. Previous studies have focused a lot on the impact of CPD on teaching and learning practices. Talbert and Mclaughlin (1994) believe that professional development has a positive impact on curriculum, pedagogy as well as student attainments. Talevski et al. (2011) further argue that professional development is of great importance for overall educational process for any school in general. This section will shed light on three areas which are improving teaching and learning practices, catering for the needs of teachers and schools, and responding to globalization. As CPD has a significant impact on curriculum delivery, teaching methodologies, and assessment strategies, Gordon (2004) outlines

three core functions of CPD which are improving teaching and learning, student assessment and school-parent collaboration.

Hartsell et al. (2009) contend that effectiveness of classroom instruction originates from the teacher. Supporting Hartsell et al.'s claim, Khan and Chishti (2012) also insist that in an educational system, teachers' CPD is an effective way to improve teaching and learning. Khan and Chishti (2012) reiterate that in an educational system, only the quality of teachers can guarantee quality education. The mastery of subject knowledge nowadays does not guarantee quality of teachers or the quality of education. Educators need both mastery of subject knowledge and appropriate teaching pedagogy to deliver the content excellently. Thus, teachers are expected to be up-to-date with all the new innovations in education. In this light, Gunnarsdottir (2014) identifies that a central issue in educational debates is teachers' opportunities to learn and develop their professional knowledge. In Talevski et al.'s view (2011), it is an indisputable fact that teachers face the challenge of continuing professional development as an imperative of modern times. Supporting the latter's claim, Khan and Chishti (2012) also affirm that it is the teacher's responsibility to update themselves according to the need of the present time. Khan and Chishti (2012) found that teachers tend to teach the same way they learnt in a teacher training program unless they believe that the change of pedagogies will yield better achievements for their students. In addressing this issue, Zambo and Zambo (2008) believe that professional development has the potential to change teachers' beliefs about their individual and collective efficacy. Similarly, Khan and Chishti (2012) assert that staff development is a process of enhancing capabilities of the staff in terms of pedagogical skills and content knowledge and recommend that CPD training that focuses on pedagogical methods allows teachers to select the right method and provide a conducive environment for learning according to the demand of the subject which could help in decreasing any drawbacks in the classrooms.

## **2.3 Impact of CPD Programs on Educational Reforms as a Result of Responding to Globalization**

The education sector is witnessing many changes in response to global changes and accountability demands. Ifanti and Fotopoulou (2011) stated that schools are facing a broad spectrum of changes and reforms which raises standards and demands. Bolman and Deal (2008) describe the change as a composite universal enterprise. CPD is seen as playing a vital role in educational reformation as Sykes (1999) positions professional development as the centrepiece for promoting change. Generally, professional development has strived to support the change but has failed in successful reformation. Gunnarsdottir (2014) insists that teaching reformation does not happen unless it involves communication and creation of collaborative learning communities rather than telling and showing. In reaffirming this vicious cycle, Hargreaves and Fink (2006) described educational change as easy to design, hard to deliver and challenging to endure. Teachers are expected to play a different role as a result of changing requirements and expectations from the communities. Frost, Durrant, Head and Holden (2000) assert that there has been a paradigm shift of teachers from being transmitters of knowledge to facilitators of knowledge and their role evolved from traditional followership to leadership in responding to rapid educational changes. This shift will not be successful unless teachers are prepared and trained. Many studies (Coetzer, 2001; Earley & Bub, 2004) found that successful implementation of any educational reformation depends on whether teachers are adequately prepared and they truly realize the importance of improving their practices by means of CPD. Hargreaves (1994) and Day (1999) insist that CPD is an essential component for successful school change and development.

In Dubai, in particular, there are high expectations for private schools. The national agenda released in January 2014 by HH Sheikh Mohammad Bin Rashid has set the expectations of students' performance through standardized tests. The educational targets cover a wide range of areas affecting the quality of education and student achievement across the different phases. Two of the targets mentioned are related to

the UAE rankings in PISA (Programme for International Student Assessment) and TIMSS (Trends in International Mathematics and Science Study). In 2021, it is hoped that the UAE will be among the 20 highest performing countries in PISA and among the 15 highest performing countries in TIMSS. The *Knowledge and Human Development Authority* (KHDA) are working with individual schools in Dubai to discuss their action plans and to provide them with individual expectation standards that they should meet in the coming standardized tests. Schools will be held accountable for their results. This demand creates an urge to have training programs to improve teaching practices and accomplish better results.

## **2.4 Trends of CPD Approaches in the Educational Sector**

The participation of the learner in learning process is an important issue. Although adult learning is different from children's learning but principles of adult learning affect the CPD structure. Mansour et al. (2014) reason that just like students, teachers need to be enabled to master new concepts. For learning to take place we need an appropriate environment, a significant content and a suitable delivery method.

Learning, as classified by Rogers and Horrocks (2010) is divided into formal learning or informal learning. Formal learning is decontextualized while informal learning is contextualized. Rogers and Horrocks (2010) argue that adults learn effectively through informal learning rather than formal learning. In support of this view, Mansour et al. (2014) claim that professional learning is shifting from didactic approaches to action based and practice focused learning that are not separated from attendees.

The implementation of a skills-based curriculum that enable students to acquire the 21<sup>st</sup> century skills requires teachers to play new role of knowledge facilitators rather than knowledge transmitter through exposing them to non-traditional CPD approaches. Teachers need to be part of cooperative learning community in a CPD program to subscribe to the idea of learning stations inside their classrooms. They need to be part of an interactive learning environment when they meet in training sessions to design a similar classroom atmosphere for their students. Hartsell et al. (2009) claim that background knowledge, proper skill sets and professional support are essential elements that allow instructional change to occur. Cimer et al. (2013) argue that the

creation of an effective teacher require CPD activities that promote reflection, collaboration and communication which leads to an increased self-awareness and a high level of understanding of implicit teaching theories. To attain this, Sabah et al. (2014) theorize that what is important is not the professional development by itself, but the successful implementation of these efforts and a clear evidence of their effectiveness. Lessing and De Witt (2007) contend that isolated participants' inputs which do not build on others' inputs have little value for those attending a CPD training program.

In terms of the tradition of PD, Palincsar (1999) criticized traditional top-down workshops as expert-driven sessions designed to convey procedural skills to teachers. Frost et al. (2000) explain that most in-service programs had a low level of impact on teaching process and school improvement due to lack of activities that are relevant to the needs of participants. Not only that, Killion and Harrison (2006) also found that traditional professional development is isolated from classroom challenges and context and may promote ideas that teachers are expected to apply without support to facilitate the transformation of learning.

To counteract these trends of PD globally, Rogan and Grayson (2003) provided an overview of the alternative approach design of PD activities which is shown in Table 1 below:

**Table 1: Levels of Professional Development Activities (Rogan & Grayson, 2003)**

Level	Design of professional development
1	Information on policy and expected changes are presented to school based personnel. Typical mode is short, one-shot workshop.
2	Examples of 'new' practices as suggested by the policies are presented to school-based personnel, who are given an opportunity to engage in these practices in a simulated situation. Typical mode is a series of short workshops lasting for one year.

3	Professional development is designed by school-based personnel depending on which new practices they wish to implement, and implemented using both inside and outside support. Typical mode consists of both external and school based professional development for two to three years.
4	Communities of practice take full responsibility for their own continued professional growth, and for school governance and curriculum implementation, calling on outside support as appropriate. Typical mode consists of ongoing school-based and directed professional development.

This study adapts the second level design of PD activities since it aims to introduce the reformation of the secondary mathematics curriculum and the related teaching pedagogies and assessment strategies that need to accompany the implementation of the new curriculum.

Carter (2008, p.26) confirms that:

Workshop participants become motivated to learn and take action when their appetite has been whetted through active engagement with ideas that relate to their real-life experience.

Alternative approaches of CPD activities are designed based on collaboration, nurturing learning communities within which teachers try new ideas, and reflect on outcomes.

Mansour et al. (2014) state that professional learning practices are shifting from didactic approaches to more action based and practice focused learning that is designed based on participants needs.

## **2.5 Theoretical Framework**

In developing the framework for identifying the key theories of evaluating the effectiveness of CPD programs, a range of pertinent educational theories have underpinned this study. These include theories pertaining to reflection, learning and motivation.



### **2.5.1 Role of Reflection**

Reflection in teacher development stems from a range of works and ideas that have mooted and explored the link between reflection and learning. Some of these works are by Schön (1983) who divided reflection into reflection-in-action and reflection-on-action, Dewey (1933) who contended that reflection began from 'perplexity', and Moon (1999) who is one of the major exponents of reflective learning at the start of the 21<sup>st</sup> century.

Dewey's (1933) work is considered the starting point of the application of reflection. According to him, reflection is a process of manipulation of knowledge and its reprocessing towards the set goal. Dewey's concept of reflective thought and action takes place through five phases which result in reflective learning. His conception provides the foundation to constructivism in teaching and learning. He believes that human interaction with the world contributes to learning and to self-guided discovery. Khan, Fazal, and Amin (2014) state that reflection as a concept in the education has its origin in the philosophy of John Dewey.

Building on Dewey's work, Schön's (1983) theory on reflections related to professional development is the most widely used. In his theory, Schön distinguished between reflections occurring at the time of the action and the reflections occurring after the action has already taken place. In 1999, Moon provided a model of reflective learning and she specified guidelines for effective reflection in learning and development scenarios. Specifically, in the discipline of education, reflection has been used predominantly in professional development.

### **2.5.2 Learning Theory**

Learning occurs where specific stimuli are introduced to the learner causing certain responses to occur which results in a change. Some main theories will be briefly mentioned here such as Lewin's theory, Piaget's theory, Vygotsky's social development theory and Bandura's social learning theory.

Kurt Lewin (in Schein, 1996) focused his work on group dynamics. Lewin's change theory demonstrates the three phases through which an organization passes through for change to happen. First, create reasons for change and motivate the staff, second, implement the necessary change and finally stabilize the operation.

Jean Piaget (1964) was the first psychologist who authored a systematic study of cognitive development. Piaget's cognitive theory has three basic components which are schemas, adaptation processes and stages of development. His theory shaped the curriculum structure where learning goals are designed to suit the stages of development of learners.

Albert Bandura (1971) believes in reciprocal determinism which means that the world and a person's behavior shape each other. Bandura's social learning theory explains human behavior in terms of continuous reciprocal interaction between cognitive, behavioral and environmental influences. Humans learn through observing each other as well as observing modeling. On the other hand, Vygotsky (1980) focused on the importance of socio cultural context. Vygotsky's social development theory focused on the link between people and the sociocultural context in which they interact in a shared experience.

### **2.5.3 Motivational Theories**

An important guide about the perceptions of teachers and other educators' motivation and engagement in professional development programs is the theory of motivation. Motivational theories discussed here are achievement goal theory, expectancy-value theory, and self-determination theory.

Achievement goal theory was discussed in many articles where the content of this theory is focused on teachers' mastery, work prevention aims and ability-approach. Butler (2007) stated that achievement goal theory aims to relate teachers' qualifications and their willingness to participate in professional development. Robustelli (2006) discussed the achievement goal theory from the perspective of the relationship between teachers and students achievement goals. This theory is relevant to the PD program design.

Similarly, the expectancy-value theory provides a framework for understanding teachers' motivation for choosing teaching as a career. Watt and Richardson (2007) believe that expectancy-value theory has implications for professional development and

policy decisions. In the same light, self-determination theory concerns supporting fundamental human tendencies to behave in an effective way. Assor, Kaplan, Feinberg and Tal (2009) point out that self-determination theory is a factor in promoting educational reform. Grove, Dixon and Pop (2009) linked self-determination theory to reasons why teachers attending professional development and the likelihood of teachers implementing professional development content.

Based on the above theories, the core features of effective CPD were selected and are discussed in the proceeding section.

## **2.6 Core Features of Effective CPD**

Many researchers and educators aimed to clarify principles of effective CPD. (Garet et al., 2001; Guskey, 2003; Margie, 2008; Sparks & Hirsh, 1997) have studied what constitutes effective CPD. Among those studies, the common characteristics of effective CPD are summarized below:

1. Has specific set goals to be accomplished
2. Builds on teachers prior knowledge and experiences
3. Addresses specific needs of teachers and schools
4. Occurs in an authentic way
5. Supports teachers in implementation
6. Collective participants
7. Spans over time

The above characteristics are discussed in detail in the following sections.

The key point here is that the content of CPD has a rationale. Earley and Bubb (2004) explain that setting clear goals for CPD activities is crucial in designing and delivering an effective CPD. The driving force in designing the content of CPD is the target goal. Fishman et al. (2003) further add that teachers' PD needs to focus on enhancement of the professional knowledge, attitudes and beliefs to enable teachers to improve their student learning. Borko (2004) also believes that having a strong emphasis on knowledge content is important for the success of any teachers' PD. Although content

design is an important feature of effective CPD, presenters tend to design content based on their beliefs. Ponte (2012) supports this claim by stating that the assumption that teachers' knowledge and beliefs drive professional practice is not convenient for PD presenters as it is much easier to organize a PD program based on theoretical issues than on practical problems.

Developing teachers' potential happens if there is enough information about teachers' prior knowledge. Bredeson (2003) observes that CPD developers should take prior knowledge of teachers into account. Likewise, Scardamania and Bereiter (2003) also note that prior knowledge is essential to enrich experiences of participants and develop their potentials by building further on their experience, knowledge and skills. Within this realm, Kwakman (2003) also contends that teachers' PD should allow teachers the opportunity to direct their own learning in addition to constructing their own knowledge.

Literature has also emphasized the need for contextualizing PD. In terms of looking at general trends of CPD, Mansour et al. (2014) criticized CPD provision as biased towards externally initiated provision rather than provisions arising directly from teachers own classroom practices. Muijis et al. (2004) agree that effective CPD should cater for specific needs of teachers. Goodall et al.'s study (2005) also shows that a positive impact at school and classroom level happens only when CPD activities and developmental needs of teachers are in harmony. Sabah et al. (2014) supports these claims by expounding that effectiveness of CPD is based on the level of applicability of the content and its relevance to classroom application to meet the teachers' needs.

Landt (2002) states that CPD is effective only when teachers are actively engaged, collaborating and participating. Teachers will confidently put what they learnt in practice when they share, communicate and reflect. In terms of learner behaviour, Skinner (2010) demonstrated that learners learn through interaction, by reasoning and argument. As such, those responsible for staff development should create the learning environment for teachers but simultaneously, acknowledge that teachers learn the best when they reflect, discuss and are in charge of their own learning. Bransford et al. (1999) asserts that teacher learning takes place when teachers are responsible for their

own learning. Skinner (2010) states that collaboration among teachers is a valuable way of learning in school and everyday life.

Many researchers (Fullan, 1993; Gordon, 2004; Hargreaves, 1997) insist that collaboration is extremely significant in shaping effective CPD. Collaborations increase teachers' confidence about the practicality of the CPD activities. Effective CPD is designed based on teachers' needs and enables them to interact while CPD is delivered. In expounding the benefits of collaborative learning, Ponte (2012) suggests that the negotiation of meanings, objectives and process allows participants to establish platforms that allow for working together.

In light of the above, Harris (2002) insists that teaching is improved when CPD creates opportunities for teachers to work and to learn from each other. Sharing and discussing ideas provides feedback to teachers on the progress of the development of their ideas and thinking. Kwakman (2003) theorises that new information and ideas are not mastered from individual learning, but to a large extent also from interaction with other partners. Warwick et. al (2004) and Sabah et al. (2014) propose that reflective forms of CPD are most valuable in enhancing teachers' instructional practices. Despite the importance of collaboration, Ponte (2012) admits that majority of professional development workshop are based on lectures, readings and assignment with minimal opportunities for teachers participation and involvement.

Regardless of teachers' educational level and professional background, teachers need sufficient support in effective CPD activities. Guskey (2002) argues that sustained support strengthens teachers' willingness to tolerate occasional failure when they are engaged in a difficult process of implementation. Several studies (Goodall et al., 2005; Guskey, 2002; Timperley, 2008) established that school or peer support is an essential factor in effective CPD. A supportive school environment encourages teachers to build on their strengths and to overcome obstacles. Studies done by Remillard (2005) and McGee (2013) also recommend that effective PD that focuses on the use of standards based curricula must focus on teacher capabilities and support them in the

implementation of the curricula. Hence, the school senior leadership team plays a vital role at this stage to assure the support in implementation. Gunnarsdottir (2014) proposes that professional development should be under the supervision of the principal and in accordance with the school professional development plan.

Collective participants refer to the participation of teachers from the same department, grade or subject in the CPD program. Birman, Desimone, Porter and Garet (2000) clarify that collective participation in PD affords opportunities for active learning and are more likely to be coherent with teachers' other experience such as subject matters, class management, age groups and content difficulties. Collective participants tend to have the same concerns and interests and their collaboration helps establish common understandings. Ponte (2012) explains that collaboration of participants requires a certain level of mutuality in the relationship among participants, so all give and receive something from each other. Secondary mathematics teachers share common concerns which are focused on enhancing their students' mathematical thinking, logical arguments and problem solving. Gunnarsdottir (2014) states that reform teaching involves more communication and creation of mathematical communities instead of showing and telling.

The time span of CPD plays a major role in the effectiveness of CPD. Timperley et al. (2007) argue that teachers require more than a one-day workshop for sustained change in teaching practice to occur. This claim is further supported by Helmer, Bartlett, Wolgemuth and Lea (2011) who insist that one off workshops are ineffective at yielding teacher change. Although Guskey (2002) and Desimone (2009) describe teacher change as a linear process, other researchers (Clarke & Hollingsworth, 2002; Huberman & Guskey, 1995; Opfer et al., 2010) challenge them by stating that teacher change is a cyclical process that is affected by the reciprocal relationship between teacher beliefs, learning, and changes in practice. Opfer et al. (2010) also concur that teacher change is not a sequential process.

It is rarely noticed that teachers change their beliefs immediately as a result of PD program attended. DeChenne et al. (2014) insists that none of the teachers were able to

clearly articulate the CPD concepts in their lesson plans. Hawley and Valli (1999) mention that teachers need enough time and many opportunities to investigate why some practices are better than others. In concurring with Hawley and Valli's beliefs, Poskitt (2005) stresses the importance of the time factor for teachers to be able to try, reflect and improve their practices.

The above seven core features as identified from literature are the key elements that have been included in the questionnaire used for this present study. Participants were asked to rank the effectiveness of the CPD program that was conducted for the purpose of this study.

## **2.7 Teacher Experience and Perceptions of the Impact of CPD**

CPD activities serve the needs of individual teachers and schools whether it is content-driven or skills-based. Getenet et al. (2013) state that professional development is recognized as a process to improve quality of educational practice, school leaders and teaching professionals. Khan (2010) defines CPD as the opportunity that helps teachers to be creative in tackling new challenges and be able to cope positively with changes by constantly updating their knowledge and skills. CPD activities are designed to develop professional attitudes towards education and to enhance teachers' knowledge, skills and competencies. Wei et al. (2009), Gunnarsdotter (2014) insist that effective professional development is a process that improves teachers' knowledge and instruction which yields to better student learning. According to Coetzer (2001), CPD activities are provided to teachers to enhance their performance in relevant areas by means of support and training. Anderson (2001) also claims that CPD is an essential practice to enable teachers to acquire and update knowledge and skills to deal with educational changes. Supporting both claims, Day and Sachs (2004) confirm that CPD enhances the quality of education.

CPD activities are designed based on identified needs and context to support teachers. Both Collinson (2000) and Anderson (2001) emphasize that CPD activities successfully achieve best results when they are structured, planned and conducted with personal

and professional growth enhancement. Talevski et al. (2011) points out that without effective professional development, a school cannot justify its purpose in reform.

Few studies have been conducted in the UAE to investigate teacher perceptions of CPD experience in high school. However, studies on teachers' PD in schools and newly enrolled teachers are available within a global context. Many international research studies on teachers' perceptions about characteristics of CPD have focused on CPD effectiveness, views upon CPD activities, needs of CPD, and factors affecting CPD participation. CPD is a complex and dynamic process and teachers have different perceptions and views of CPD based on their personal experience. Lee (2002) reported that the least important feature of CPD by participants is the "well planned session" while content relevance and practicality of promoted ideas was the most important Moore and Shaw (2000) concluded that teachers are usually interested in PD content relevant to their classroom practices. Nisbet (2004) also found that teachers prefer classroom-based topics held at their own schools.

## **2.8 Summary**

This chapter reviewed the meaning and functions of CPD programs and focused on the impact of CPD on teaching and learning process. It also focused on the importance of CPD activities to cater to the needs of schools and teachers as well as conducting CPD as a response to globalization. The review of literature has raised some important issues related to the core features of effective CPD such as collective participants, duration, relevance of content and collaboration. CPD will be described as effective only when teachers' voices are heard and their needs are addressed.

Based on the fundamental theories of reflection, learning and motivation presented in the theoretical framework, the key features of an effective CPD, impact of CPD program and teachers' perceptions of CPD are addressed in the design of the project. Those themes that emerged from the literature review will shape the design of this research. The coming chapter will focus on the methodology and the research instruments.



## **Chapter Three: Methodology**

The aim of this study is to investigate the perceptions of secondary mathematics teachers regarding the CPD program conducted to implement new mathematics curriculum. This chapter outlines the methodology of the study, and provides details on the research approach and design. Creswell (2003) states that methodology in research refers to the strategy or plan of action that links methods to outcomes and governs the choice and use of methods.

This chapter presents all the various aspects of the methodology that guided the research process. These include the explanation of the research design, the context of the CPD program, the data collection instruments, participants, design and delivery of CPD, data analysis process, issues of validity and reliability, and ethical considerations.

### **3.1 Research Approach**

Research design plays a vital role in achieving the aims of the research. Trochim (2006) defines research design as the structure of research, that is, the 'glue' that holds all of the elements in a research project together. The research design provides specific direction for procedures used to collect the data. The usage of one approach to collect data will be inadequate to develop multiple perspectives and answer the questions of this research with complete understanding of the impact of CPD program. Therefore, the present study aims to use a mixed methods approach, combining quantitative and qualitative techniques to best answer questions of the study. Dick (2001) argues that good research is one that uses a methodology which fits the situation and the goals being pursued. The instruments used are semi-structured questionnaire, interview, and the CPD content itself. Johnson and Onwuegbuzie (2004) state that mixed methods research builds on both the quantitative and qualitative approaches which can be used simultaneously in a single study. In this study, a quantitative-qualitative model, sequential qualitative, of mixed method design was used in an attempt to investigate, cross validate and corroborate the findings. Creswell (2003) explains that this strategy uses both quantitative and qualitative methods of data collection concurrently in order to best understand the phenomenon of interest. A semi-structured questionnaire was administered first to collect the quantitative data. Throughout the CPD program each

participant was provided with a notebook to keep a professional development journal and document all reflections. Then each one of the 20 participants was interviewed separately using a free response interview survey to collect the qualitative data. Both quantitative and qualitative data support and strengthen one another to obtain integrated findings and draw inferences. Williams (2007) affirms that the goal of researchers using the mixed methods approach is to draw from the strengths and minimize the weaknesses of the quantitative and qualitative research approaches. Arizon and Cameron (2014) argue that mixed methods studies are a challenge due to the work efforts that they require and the time span. Creswell (2003) states that concurrent procedures entail collecting both quantitative and qualitative data at the same time during the study and then integrating the information in the interpretation of the overall results. Similarly, Johnson and Onwuegbuzie (2004) insist that a method is not entitled to be called a mixed method design unless there is mixing or integration of data at some point in the study.

The mixed method approach suits this study as the main goal is to get a deeper understanding of effectiveness and efficiency of CPD program in a private school in the UAE, which according to the researcher, no single method can do. Johnson and Onwuegbuzie (2004) claim that today's research world is complex and dynamic which demands that one method complements the other. The combination of both qualitative and quantitative methods in the data collection process as well as the use of multiple sources of information enabled adequate insights into the issues. The multiple sources stem from both the quantitative and qualitative elements of the survey, and from the qualitative interviews held with all the participants. Creswell (2003) believes that the mixed method approach ensures that biases that might be inherent in any single method can be neutralized or even eliminated. Instruments used were a combination of structured and free response which provided a realistic vision of the perceptions of the participants about the delivered CPD sessions. Creswell (2003) further reiterates that this approach can reduce the time for data collection and hence, enable the researcher to complete the study in the given period of time. The mixed methods approach enables

the researcher to collect a broad range of data that is not limited only to rating a pre-designed set of questions.

### **3.2 Context**

The study was conducted in a private school in Dubai, the United Arab Emirates. The sample chosen was representative because it included all attendees who attended the CPD program which was conducted between April 2014 and September 2014. Dubai is the second largest emirate in the United Arab Emirates (UAE). Cooper (2013) states that Dubai transformed from sparseness of a small city to a blooming city. It is one of the fastest growing cities on the planet and one of the world's most desirable destinations. This city has a population of more than two million people comprising more than 200 nationalities. The diversity of nationalities and their cultures have given Dubai a unique cultural outlook with phenomenal characteristics. As such, the educational system in Dubai aspires to international standards for both citizens and residents. There are wide choices of curricula and many international schools to choose from. The study took place in a private school in Dubai, the United Arab Emirates (UAE), during the last three months of the academic year. The selected school has an American international curriculum for KG-12. The school was established twenty years ago; it has more than 2000 students from 43 different nationalities.

The purpose of the CPD program was to introduce the new skills-based curriculum framework which draws the road map of the teaching and learning process. It is structured based on the 4 C's of education and the 21<sup>st</sup> century skills. One of the goals of the CPD was to increase teachers' mathematics content knowledge, improve student learning outcomes and introduce suitable teaching pedagogies. The CPD was designed to allow secondary mathematics teachers to celebrate, communicate and share their best practices and ideas to unify their strategies and align them with the school's action plan. Blazer (2005) states that development programs will allow the formation of professional learning teams who share goals for students, experience, common knowledge and vocabulary.

Teachers who participated in the CPD have more than five years teaching experience, and at least three of those years were in the school where the study was conducted. The 20 secondary mathematics teachers participated in 30 hours of CPD by attending 5 workshops. The workshops were distributed over a period of three months to enable the participants to grasp the content and to strengthen understanding of their usage.

The first session occurred in April 2014. It focused on the curriculum framework structure and its components. Subsequent follow up sessions focused on aspects of implementing the curriculum framework such as teaching strategies, assessment types, scope and sequence, and SMART learning outcomes.

### 3.3 Participants

There were twenty participants involved in this study. They were secondary mathematics teachers in a private school in Dubai. The Dubai Statistics center released a report (2014) called Employment in Private Education by Stage, Nationality and Gender - Emirate of Dubai. This report shows that there is a total of 2,763 secondary teachers in Dubai divided as follows:

**Table 2: Number of secondary teachers in private schools in Dubai in 2014**

Description	Number of teachers
female secondary teachers	1682
male secondary teachers	1081
non Emirati female secondary teachers	1676
non Emirati male secondary teachers	1081
Emirati female secondary teachers	6

The ratio of secondary mathematics teachers to all secondary teachers is 2:30. The total number of secondary teachers in the private sector in Dubai is 2,763 which suggests that the total number of mathematics teachers is approximately 184. Thus, the twenty secondary mathematics teachers who participated in this study constitute around

11% of the total population available in Dubai which can be construed as a purposeful sample.

The participants completed a demographic sheet to provide information about their nationality, level of education, major, years of training, experience and years of work in the UAE. Sixteen participants (80%) reported having a bachelor's degree in pure mathematics and four participants (20%) have a bachelor's degree in pure mathematics and a teaching diploma.

All of them have more than five years of experience; three of those years were in the school where the study was conducted. Three of the participants had more than 16 years of experience. They all participated in a number of training experiences in school as well as outside the school. They varied in the number of years they have been living in Dubai, the UAE. All of them are from the Middle East; five were originally from Palestine, three from Jordan and the rest are from Lebanon. Thirteen were males and seven were females.

### **3.4 Study Instruments**

Since the study used a mixed methods approach to collect both qualitative and quantitative data, the use of questionnaires and interviews are appropriate data collection methods for the study. Below is a brief description of the research instruments that were used in the study.

#### **3.4.1 Semi-structured Questionnaire**

One of the most widely spread methods of gathering data is through questionnaires. It is used to collect both quantitative and qualitative data in survey designs. The semi-structured questionnaire was developed after reviewing an extensive literature review related to CPD (e.g. Guskey 2002; Goodall et al. 2005) and was developed from the research questions of this study. It was designed to evaluate the effectiveness of CPD provided in a private school in Dubai (see appendix 1). All participants were asked to

consider their CPD experiences from the point of view of opportunities offered to them, the modes of delivery utilized by the presenter, the characteristics of CPD and the duration of the PD meetings. The semi-structured questionnaire was reviewed by an independent researcher to check the appropriateness of the questions and their prompts. It was developed and piloted in the English language, as it is the language of instruction used by all participants in their respective mathematics classes. The review of related literature allowed us to select and design questions that best represent each dimension of the CPD.

For the quantitative data, all participants completed the questionnaire after each session. The questionnaire consisted of seven questions to be rated using a 4 point scale, and four free response questions. A Likert scale of 4 point scale rate was used where 1 stands for 'strongly disagree', 2 stands for 'disagree', 3 stands for 'agree' and 4 stands for 'strongly agree'. Those questions focused on CPD provision, level of impact, area of impact as perceived by teachers, impact in terms of the extent to which CPD learning had been shared with them, and organization of CPD. The feedback specified to what extent participants agree or disagree with the content of program, the presenter's attitude and methodology, the relevance to their career, its impact on enriching their experience, and the appropriateness of the material. The open-ended questions allowed the participants to reflect on their developmental experience. Sabah et al. (2014) argue that open-ended questions have an inviting quality and encourage participants to react and qualify their responses. Questions were focused on the relevance of workshops, areas of improvement in the developmental program and the usefulness of the new skills in the participants' teaching and learning journey. (Refer to appendix I)

### **3.4.2 Reflective Professional Development Journal**

The professional development journal is a written record of the CPD content and a reflection of their experience during the sessions. Professional development journal is subjective which reveals the competencies of the person who writes them. Participants write freely specific points that are relevant to their work where they capture the experience and some critical incidents. The reflective writing is a very effective way to

make sense of experience, to organize and evaluate the learning experience of the CPD program. The writing style was free, informal and spontaneous. Participants were advised to use visual preference, include diagrams and any other visual modes. Cimer et al. (2013) remark that the reflective process enables teachers to share their experience and provides an opportunity for collaboration.

Each participant was provided with a notebook when the first session of the CPD program was conducted to use as a professional development journal. The researcher explained the benefit of using the professional development journals and set the expectation of developing this subjective record throughout the program.

Reflections were one of the essential aspects of continuing professional development because it provided a precise feedback which enabled the trainer to improve the quality of CPD program. This process helped bridge the gap between theory and practice, to deal with ambiguity, stress and change, and to lead to critical awareness. Participants' free writings enabled the researcher to look critically at the session content, to consider unique problems which were never met before and to cope with new issues.

### **3.4.3 Interviews**

The qualitative sources of data included interviews. An interview is an important tool for collecting data. It allows participants to reflect and express their points of view without any constrains. Sabah et al. (2014) state that interviews encourage participants to react about their experience and state their thoughts freely. Maree (2007) states that an interview is a two-way conversation in which the interviewer asks the participant questions to collect data and to learn about the ideas, beliefs, views, opinions and behaviors of the participant. The collected data from interviews provides rich descriptive data that reflects the participant's construction of knowledge. The structured interview in this current study was developed to help the participants explore their views, ideas, beliefs and attitudes concerning the implementation of the CPD program.

Thus, the interviews are opportunities for the attendees to express their points of view. At the end of the study, after three months of conducting the CPD workshops, an in-depth interview lasting approximately 75 minutes was carried out by an independent

researcher with 20 teachers individually who were involved in the CPD program. The interviews were done in narrative style to allow teachers to interpret, judge and reflect on each question. Maree (2007) asserts that a narrative style allows the researcher to see the world through the eyes of the participants. As part of the ethical consideration, teachers had the option of reading their own transcripts and making adjustments. Creswell (2009) states that it is vital that interviewers understand the importance of allowing participants to edit their answers when they are interviewed in order not to be misinterpreted. The interview consisted of four questions. The questions investigated the impact of CPD program on new implementations, new teaching strategies adopted based on CPD activities, the type of needed support to implement new ideas and the desired themes for future CPD programs (refer to appendix II).

### **3.5 CPD Content**

The content addressed in each CPD session informed and influenced the work of participants during the meetings and in preparing the lessons. The themes were designed to enable the new reformation in the school to take place and to provide participants with the required knowledge and skills to make this change happen. Although the first theme “curriculum framework” drew the general guidelines for the rest of the CPD, participants were eager to connect the activities and sessions and make a rational connection to their classroom practices.

As such, curriculum reformation requires the creation of a community of teachers who meet to talk, learn and share from each other. Although the curriculum framework adopted for the CPD introduced the secondary mathematics curriculum, the introduction of the new content alone would be meaningless. “Scope and sequence” theme clarified the path for a proper implementation which ensures that the transition phase will not create any gaps. Discussions of participants were mainly about depth and breadth of the curriculum. They all agreed that the pace of teaching will guarantee the mastery of concepts and the progression of skills. Allen (2011) argues that students think mathematically when they are provided enough time to learn actively and vocally. At this point, participants were wondering about major issues such as teaching strategies, change in practice and assessing students’ achievements. Mathematics teachers are



focused on their students' achievements and are mainly interested in the means that enable them to achieve that goal (Merrill et al., 2010). Thus, the ultimate goal for mathematics school teachers when attending any CPD is to improve student learning in mathematics.

The language of standards stated in the curriculum is not student friendly. Alternatively, the "SMART" theme focused on training teachers on how to produce learning outcomes that are comprehensive, specific and measurable, and that can be shared with students.

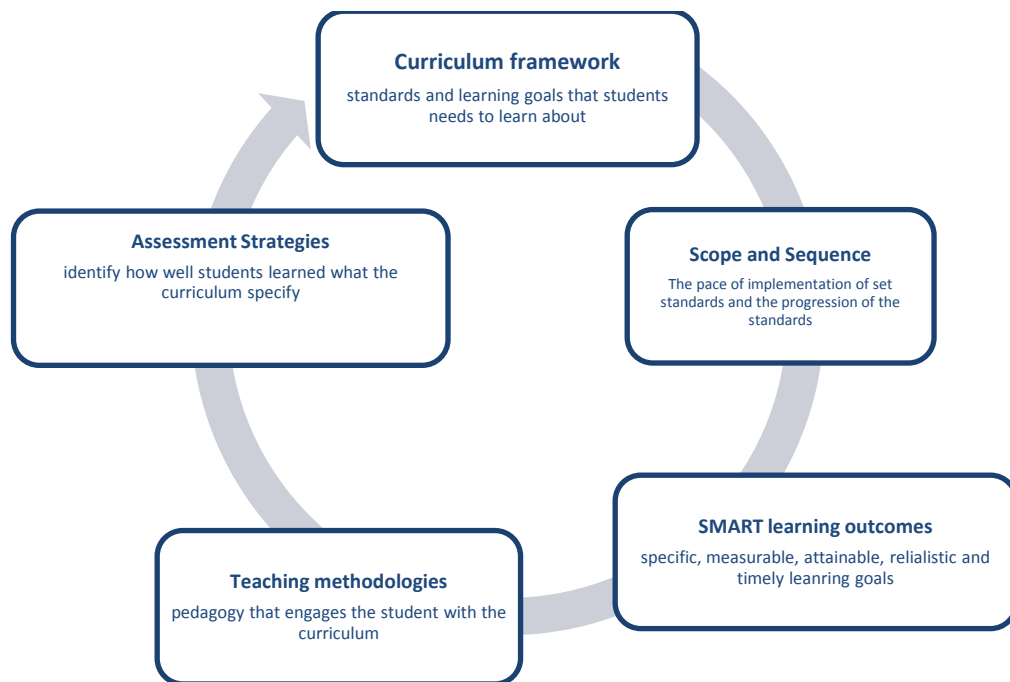
The fourth theme encouraged teachers to put their learning into practice in the classroom by promoting teaching methodologies to deliver the content. The discussions were focused on inquiry-based learning and problem based learning that increase the involvement of students in their own learning. Participants were specifying the teaching strategy that is most suitable to each standard content. Pros and cons of each teaching strategy were discussed to ensure that the change in teaching will yield better results in international standardized tests such as TIMSS and PISA. Students' achievements were the main concern for secondary mathematics teachers and at the heart of all discussions. Participants were eager to acquire new techniques and to develop their teaching abilities only to be able to accomplish the stated target. They were discussing the current strategies used at present to identify the changes that they can amend to increase students' involvement in their learning.

The fifth theme targeted assessment strategies, in particular, formative assessments. This session was the missing piece of the jigsaw that completed the picture. Participants expressed their desire to assess their students and get reliable data to act as the driving force to modify the lesson plans before students sit for international standardized tests. Formative assessments are also recommended as effective strategies by several studies (William, Lee, Harrison & Black, 2004; Black & William, 2009) in charting on-going student progress and identifying problems or weaknesses at an early stage.

### **3.6 Structure and Delivery of CPD**

The researcher worked with participants to design, develop and evaluate intervention plans. Baker (2006) argues that the ultimate level of involvement is when the researcher conducts a study in a region he belongs to and studies a group in which she/he is already a member. This enabled her to have firsthand experience on how CPD programs are conducted in terms of the methods used to impart the knowledge and skills to the teachers, the materials given to teachers, the expertise of the CPD facilitators, the logistical arrangements of the workshops, and any other issues that were of interest to this study.

The CPD workshops are less formal because they are planned by the researcher in collaboration with the school based on KHDA recommendations, school vision and departmental needs. Sabah et al. (2014) stress the importance of collecting information about teachers' needs in the planning process of CPD. Teachers participated in 30 hours of CPD workshops. The CPD content was focused on three domains: learning outcomes, development and presentation. The first domain focused on learning outcomes or objectives which are specific, measurable, and actionable; the evidence examples will be presentation material, and mapping of the objectives to the standards. The second domain focused on the development of the content that is relevant to attendees; examples of such evidence are course content, presentation handouts, and collected feedback. The third domain is presentation of the content in the workshops; the evidence is the hands-on activities and illustrations that were presented and used. The titles of the sessions were curriculum framework, scope and sequence, SMART learning outcomes, teaching methodologies, and assessment strategies. Figure 1 below illustrates the sequence of the conducted sessions.



**Figure 1: CPD content**

During the CPD workshops, participants were asked to work collaboratively in pairs. The participants decided on their own pairs. They chose their partner based on the same year level or student age group. Some chose to have more than one peer to form a group of three maximum. Each pair or group set their goals and expectations of the conducted CPD based on the workshop objectives. Reviews by Shriner, Schlee, Hamil and Libler (2009) contend that the time span and contact hours of any development program have a significant impact on the opportunities for active learning because it allows teachers to have discussions and interact together. At the end of each CPD the participants completed the semi-structured questionnaire feedback form called secondary mathematics feedback form (SMTFF).

The planned professional development meetings started in April and ended in June. Participants met again after three months in September to discuss any issues such as implementing the new teaching methodologies, designing the lesson plans and sharing their implementation plans based on the CPD conducted earlier. Participants had roundtable discussions in September and they collaborated to produce the new plans for the academic year. After those collaborative meetings, they were interviewed

individually by an expert to ensure objectivity and validity of data since the researcher was also the presenter. The free response questions focused on the new implementations that the teacher has planned to do based on the CPD program, usefulness of ideas and their relevance to classroom practices, and the recommended themes of future CPD (refer to appendix III).

### **3.7 Ethical Considerations**

In this study ethical issues were taken into consideration when gathering and analyzing data because CPD inevitably impacts the lives of other people. Waters-Adams (2006) emphasizes that any research which involves other people in some way has ethical implications. Respecting the right to privacy and participation, confidentiality, and avoiding harm to participants are principles that have been adhered to during the data collection process, data analysis and interpretation as highlighted by Cohen et al. (2000). The participants were assured that their identities would remain anonymous and all information supplied by them in the questionnaire would be kept confidential.

The instruments used in this study were tested before their administration to ensure that they are valid and reliable. Maree (2007), Kothari (2004) and Mark (1996) consider validity as the degree to which an instrument measures what it is supposed to measure. Although total reliability is difficult to achieve since human beings are not static, this study has strived towards achieving validity and reliability. The content validity of the instruments used in data collection was ascertained by two expert colleagues in education.

In summary, this chapter has discussed the theoretical approach that guided this study. The chapter examined the research design in an effort to specify the frame of the study and its suitable context. After examining the design thoroughly, the study fits into mixed method design which uses quantitative and qualitative approaches in collecting the data. The chapter further looked at context where the study took place and highlighted the timeframe of the CPD program. Details were also given on sample and participants. Thereafter, the design and the delivery was discussed which gave an insight into the

population from which the data was solicited. Then the data collection instruments were detailed and these included questionnaires and interviews. The last part discussed the data analysis, ethical considerations, validity and reliability. The proceeding chapter will focus on data presentation and analysis.

## Chapter Four: Results and Discussion

This chapter presents the findings and analysis of data collected on teachers' perceptions of continuing professional development (CPD) program conducted with respect to their preference, effectiveness and impact on lesson planning. The participants were twenty secondary mathematics teachers from three private American curriculum schools in Dubai. The data collected from the SMTFF questionnaire, teacher reflections, and individual interviews were analysed to address the following research questions:

1- What are secondary mathematics teachers' perceptions of the impact of CPD program on their teaching proficiency?

2-What are the key features of a successful CPD program for secondary mathematics teachers?

Both quantitative and qualitative data were collected in this study and consequently, the emergent data were analyzed quantitatively and qualitatively. The quantitative data was coded. Data was entered and analyzed using descriptive statistics. They were made up of normative and ordinal variables. The data file creation involved entering the coded quantitative data into a computer package known as the Statistical Packages for Social Sciences (SPSS). Tables and figures were constructed from the SPSS data file to facilitate further analysis of the data. The qualitative data collected will be analyzed by tabulating the free responses that will be recorded by the participants. Common themes will be clustered and differences in participants' responses will be identified. Ranking the responses will help to uncover the main issues that will arise.

The sequence of the study's data analysis is presented in the following order. First, the quantitative results were analysed followed by qualitative data. The findings of the research study were linked to the content of the SMTFF questionnaire data and the interview responses.

## 4.1 Quantitative Results: SMTFF Questionnaire

Teachers' perceptions about the effectiveness and relevance of CPD program after each session were explored in the SMTFF questionnaire responses through the rating items. The key factors that were evaluated are the achievement of learning outcome objectives, relevance of activity and content to practice, suitability of delivery methods, and overall satisfaction (organization, pace of delivery, approach of trainer, and readiness of participants).

As shown in table 3, the responses of the teachers varied but to a very large extent almost all of them were satisfied with the CPD program where the standard deviation for each question varied between 0.5732 and 0.6797 and the present means first is between 3.400 and 3.726 indicating that almost all participants agreed that their participation in the CPD program was beneficial.

**Table 3: Descriptive statistics analysis of participants' responses.**

Descriptive Statistics					
	N	Mean		Std. Deviation	Variance
	Statistic	Statistic	Std. Error	Statistic	Statistic
I found this workshop to be valuable	95	3.568	.0629	.6129	.376
The workshop was engaging	95	3.400	.0692	.6748	.455
The workshop goals were clearly identified and accomplished	95	3.547	.0665	.6485	.421
The workshop was well organized, well presented and conducted	95	3.589	.0626	.6101	.372

The workshop content is important to improve students' outcomes	95	3.726	.0588	.5732	.329
The workshop materials were relevant and appropriate	95	3.516	.0633	.6165	.380
I learned new skills and strategies that can be readily put to use	95	3.442	.0697	.6797	.462

When analysing the participants' responses for each workshop separately, it was found that there is no significant difference between the overall CPD workshops' scores and each individual workshop. The majority of teachers ranked the workshop features, content and relevance of content. This data provides a baseline for judging the degree of learning of participants that occurred as a result of attending the CPD sessions. The table below shows the overall responses of the participants after conducting the CPD program.

**Table 4: CPD SMTFF total feedback responses of participants.**

Item	Total	Strongly disagree		Disagree		Agree		Strongly Agree	
	n	f	%	f	%	f	%	f	%
<b>Q1:</b> I found this workshop to be valuable	95	2	2%	0	0%	35	37%	58	61%
<b>Q2:</b> The workshop was engaging	95	2	2%	4	4%	43	45%	46	48%
<b>Q3:</b> The workshop goals were clearly identified and accomplished	95	2	2%	2	2%	33	35%	58	61%
<b>Q4:</b> The workshop was well organized, well presented and conducted	95	2	2%	0	0%	33	35%	60	63%
<b>Q5:</b> The workshop content is important to improve students' outcomes	95	2	2%	0	0%	20	21%	73	77%
<b>Q6:</b> The workshop materials were relevant and appropriate	95	2	2%	0	0%	40	42%	53	56%



<b>Q7:</b> I learned new skills and strategies that can be readily put to use	99	2	2%	4	4%	43	43%	50	51%
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The responses to the fifth item which aims to evaluate the importance of content of CPD sessions to improve students' outcome showed that almost all teachers strongly agreed (77%) that the content of the CPD workshop was relevant to their classroom practices. Participants were positive about the value of the CPD sessions with 98%(N=95) strongly agreeing and agreeing that the content will impact student achievement

The responses to item four evaluate the features of an effective CPD related to the trainer, delivery method and content. 63% of participants strongly agreed that the workshop was well organized, presented and conducted. Participants were positive about the value of the CPD sessions with 98% (N=95) strongly agreeing and agreeing that the features of the sessions were effective.

The responses to item one intended to evaluate the overall satisfaction of participants with the CPD program. 61% of participants indicated that CPD workshops were valuable. Participants were positive about the value of the CPD sessions with 98%(N=95) strongly agreeing and agreeing that the content of sessions was valuable.

The responses to item six aim to evaluate the suitability of the material used by the trainer to deliver the designed content. 56% of participants indicated that the material was relevant and appropriate. 97%(N=95) strongly agreed and agreed that the content and resources are relevant and appropriate.

The responses to item three aim to evaluate the level of achievement of the learning outcome objectives. 61% of the participants strongly agreed that the goals were clearly identified and accomplished. The vast majority of participants 95%(N=95) strongly agreed and agreed with the statement that the goals of the CPD program were shared with participants and accomplished by the end of each session.

The seventh item aims to evaluate the relevance of activities and content to participants. Teachers' responses indicate that 51% of the participants strongly agree that the CPD would have a huge impact on their career due to the new skills and

strategies that they have learned that can be readily put to practice. 93%(N=95) strongly agreed and agreed that new techniques can be immediately implemented in secondary mathematics classrooms.

The responses to item two aim to indicate the level of engagement of participants in the sessions that they have attended. Less than half of the participants (48%) strongly agreed that they were involved in the sessions. Participants were satisfied with the level of engagement where 93% (N=95) strongly agreed and agreed that they were part of the session.

## **4.2 Qualitative Results**

The responses of the participants to the SMTFF free questions, professional development journals and interview responses were tallied and analysed. The analysis of the SMTFF free response questions are displayed below based on the session's seven themes. The analysis of the professional development journals indicated the reflections of participants which provided a realistic image of the perceptions of the participants about the impact of CPD program. The interview responses will be displayed based on the questions that were discussed between the independent interviewer and the participants three months after the last session was conducted.

### **4.2.1 SMTFF Free Responses Questions**

The analysis of the responses of the participants in each session respectively revealed the change in the perceptions of participants from one session to the other. They were less expressive in the first session especially when they were asked to talk about the usefulness and the practicality of the content due to the complexity of the content of that session which discussed the curriculum content. There was a drastic switch in their answers about the third session which focused on learning outcomes and setting students goals. The reflections in the last sessions were remarkably communicative which included perceptions about the role of the trainer and the CPD organizer.

### **Theme 1: Curriculum Framework**

While some responses were indicative of the relevance of content such as: *“Feel more aware and confident to reach our educational goals as a school”, “being familiar with curriculum renovation and development”* other responses showed how participants are trying to connect the content with other topics such as *“link between curriculum and assessment”, “encourage teachers to use more teaching strategies that help and serve the learning process.”* Due to the sophisticated structure of the curriculum, many participants recommended to have opportunities for exchange of ideas between peers to take place during the session to enable them to establish better understanding of the curriculum structure and to plan for more engaging activities by stating: *“engage more the audience by more activities”, “more examples from different subjects”, and “more visual information”*. One participant recommended that in future workshops *“it would be helpful to receive an email which provides a preview in advance to the CPD workshop to prepare ahead of time”*.

### **Theme 2: Scope and Sequence**

The participants’ reflective free responses demonstrated their satisfaction with the CPD program with two major recommendations *“more time for each group”, “giving more examples”*. They were pleased about the relevance of the pace of the implement of the standards *“the workshop is good enough”, “it is good enough to let us work”*.

### **Theme 3: SMART Learning Outcomes**

Participants raised concerns about the application of promoted content in classroom *“conduct another workshop and by applying it in classes”*. The conversation was focused on specifying the difference between each criteria by stating *“aiming at being a bit more specific by asking teachers to do a detailed list for each letter”*. The exchange of ideas and opportunities to exchange the new ideas remained a continuous demand from many of them: *“be more engaging and give more details”*

### **Theme 4: Teaching Methodologies**

Many participants recommended applying new teaching methodologies in classroom and allocating more time and resources for this topic. They stated *“each concept should*

*be given more time to make the most of it (application)", "more examples on each topic", "let the teachers provide examples (specific examples) and call them by their names so that it becomes more interesting", "by asking teachers to demonstrate specific examples".* There was a desire to focus on fewer methodologies in order to address those issues especially when they reflected saying *"each concept should be given enough time"*. Many raised concerns about the approach that they need to adopt in the classroom and requested to extend the sessions to include modeling the teaching strategies in a real context. One participant recommended that the trainer demonstrate the promoted ideas in a class, *"enter a classroom for each subject and apply all of the detailed points facing 20 students"*. Toogood (2008) states that trainers must be capable of demonstrating working methods rather than merely describing them for participants.

### **Theme 5: Assessment Strategies**

Almost all teachers found assessment strategies useful in providing an immediate feedback about the students' performance especially the usage of formative strategies such as *"It was very well prepared, planned and conducted."* *"Clear plan and Learning Outcomes."* *"Today was very interactive."* *"Secondary students need to be assessed to determine the critical thinking skills to score well in SAT."* *"Formative assessment strategy that helps know level of math understanding is written assessment."* Hence, this indicates that teachers could be more confident in the area of assessment and are able to apply the concept of formative assessments.

#### **4.2.2 Teachers' Reflections**

Participants kept a professional development journal to outline the content developed throughout the CPD program. They kept reflective diary entries which contributed to assessing the activities of the sessions. Participants were reflecting on what they do well, what they could share with colleagues and what they still have inquiries about. They expressed themselves freely without being limited to responding to any question or specific inquiry. Participants openly expressed their perceptions about the effectiveness of CPD program. The reflections varied a lot from one participant to another but the concerns were almost common to everyone such as collaboration and relevance of the experience to their classroom practices.

In their journal notebooks there was a clear indication that their collaboration developed confidence that allowed them to follow their own directions rather than composing their lessons in details. Some reflections are:

*“I think that it’s really good to discuss the topics with parallel teachers who have been teaching for a long time in this school and who are experts in the culture and the diversity of students. Talking to them made more sense than listening to the trainer”*

*“I feel I need ideas from other teachers. Activities are attractive but they sound perfect to an extent that they are applicable in the ideal world not in our classrooms with the type of students we have”*

*“Wish that those collaborative meetings will extend after the sessions are over. Cooperation means team means success!”*

*“I learnt something that I do not even know about standardized test practices and tactics to tackle TIMSS questions”.*

*“Our goals were different but it was okay because we enriched each other’s knowledge and shared best practices, we talked about what we want to achieve and we discussed each time the issues related to our school environment and how they relate to the activities to make sure that we are on the right track”*

Teachers were enthusiastic to discuss collaborative classroom practices in which students interact, model and experiment. This was evident in many of reflective writings in the teachers’ journals. Thus, a CPD program strived to include opportunities for teacher reflections to link to CPD content to teachers’ perceptions of the realities of their classrooms.

The reflections of teachers showed that mathematics teachers are focused on the quality of learning rather than the quantity of delivered content as clearly expressed by a participant. They were eager to explore new terrain that can add new flavour to their classroom ingredients. One participant reminisced on a classroom incident and linked it to the CPD experience:

*“The hyperactive student that was a problematic source could have been a good student if I planned cooperative learning activity based on his interest. Myself I enjoyed using my motor skills while learning so what about my kids!”*

Another journal entry suggested to consider the most suitable classroom environment for a mathematics classroom;

*“Is this relevant to me? Will this help my student or it will only please them? What is the point of having a jungle in the class.....only quite class help focus concentrate?”*

Another suggestion pertained to find ways to motivate students because indirect teaching strategies require students' involvement;

*“get outside people in, this is better.....the trainer exhausted herself talking about teaching strategies, all my students are lazy and they just want the rule to apply and solve, this is what they think math is”*

#### **4.2.3 Interviews**

Follow up interviews were conducted three months after the last CPD session was conducted to determine whether participants applied what they learned into their classroom instruction. The interview data revealed the level of implementation of the activities and practices discussed in the CPD program. The forms of CPD were consistently viewed by the teachers interviewed to have the greatest impact on professional growth and change.

The first question “what are the new implementations that you have had this year as a teacher at three levels, bulletin boards, preparation and teaching strategies?” was focused on the new implementations that participants are planning to do. On lesson preparation level, responses were focused on real life connections, increase students' involvement, and share learning outcomes with students, deploy differentiated teaching instructions and selecting the suitable teaching strategy. Some responses are:

*“interactive bond with students”, “more real life application”, “prepare period by period focusing on teaching strategies used depending on LO we are teaching”*. The teaching strategies mentioned by participants were all related to indirect teaching methodologies such as: *“use new strategies”, “use individual inquiry reflection discussions”, “shift from*

*classical way of teaching to a new developing ones”, “Use cooperative learning activities”.*

The second question “Specify the ideas/ strategies/ practices that you found useful and applicable from what we have discussed in the orientation?” was focused on the new practices that the participants will deploy in their profession based on CPD program. Interactive student notebooks, formative assessment strategies, cooperative learning activities, indirect teaching strategies and standardized test practices were common new implementations reported by most participants. Most of them responded that the most effective CPD activities were the ones that promoted teaching strategies and formative assessments.

The third question “What would be the topic(s) of the coming CPD?” investigated the participants’ interest in future CPD themes. Formative assessments, teaching strategies and student portfolio assessments were the main themes that were identified to be part of future CPD programs. Two responses were focused on sharing practices and real life connections *“More activities, links between materials and methods of teaching, we want the students to deduce everything from life.” “The coming CPD would be about sharing practices of how we implemented the standardized practices in our lessons, what we put in the bulletin boards. How are we improving the student’s enthusiasm towards learning Math? How are we keeping them engaged: we must share practices! We can learn from one another.”*

The fourth question “If you have any concerns/comments please write them down” gave opportunities to participants to express their worries and concerns. The findings of the workshops present considerable variation. Some participants showed clear support for the CPD activities while others showed interest in continuity of support and in modelling the CPD. Teachers expressed their concern about the continuity of the support after the CPD program when they start applying the new strategies. Freidman and Phillips (2004) affirm that CPD must embrace the continuity of professional learning and support. One teacher recommended peer collaboration when he stated his concern:

*“The coming CPD would be about sharing practices of how we implemented the standardized practices in our lessons, what we put in the bulletin boards. How are we*

*improving the student's enthusiasm towards learning Math? How are we keeping them engaged: we must share practices! We can learn from one another."*

A number of teachers expressed their concern about the time management by stating *"I'm concerned regarding time management in applying all the new strategies we are learning."* Other concerns were *"I am concerned of the new strategy that we might not catch the whole topics"*, *"Difficulty in open ended questions"*, and *"Difficulty in preparing a lesson plan which include teaching methodology, assessment strategy and tiered assignments."*

Thus, in general, the interviews revealed that the CPD program had an impact on their lesson preparations and on the new implementations that they are planning to amend in their plans and it raised a concern about the need for continuous support once they start implementing the new practices and strategies. Thus, whilst the participants did not always put what they learned into practice they articulated ways in which they amend new methodologies and strategies in their teaching. It remains the case that actual change in behaviour, measured in terms of changing teaching practices as a result of learning, was very limited

### **4.3 Discussion**

Based on the qualitative and quantitative findings from SMTFF questionnaire, interviews, CPD content and professional development journals, it was identified through participants' perceptions that time span, relevance of content to practices, encouraging course participants to collaborate and model specific targets in classroom context are the core aspects of CPD. Responses are grouped under four main results which are collaboration, impact of CPD program, relevance of content, and approach used to deliver the CPD content.

First result is collaboration which appeared to increase participants' confidence in terms of their ability to articulate views on educational issues to their peers. The study findings indicated the willingness of participants to experiment new approaches to teaching and learning. They favored the CPD approach which featured communication flowing from



conversations among participants rather than communication flowing from the trainer to the participants. This draws parallels with the literature review about the importance of collaboration as a core feature of effective CPD (Gordon, 2004; Harris 2002; Kwakman 2003; Landt 2002; Skinner 2010; Sabah et al., 2014) to create a sharing culture where participants have opportunities to engage actively in inquiry-based practice.

Simultaneously, the results indicated an urgent need in providing sufficient time to allow participants to become confident and enthusiastic about trying new ideas. These findings are expected as they align with previous studies (DeChenne et al., 2014; Helmer, Bartlett, Wolgemuth & Lea, 2011; Opfer & Pedder 2010;) which stress on the importance of time span as an important feature of an effective CPD program.

Collaborative work also develops enthusiasm for communicating ideas and enhancing knowledge and practice. Ponte (2012, p.320) asserts that the collaboration and negotiation of meaning, objectives and processes between participants allow establishing a “platform” for working together.

Second result is the impact of the CPD program. Data was analyzed at different levels to answer the study questions related to this issue. Responses of SMTFF indicate that CPD sessions will have a huge impact on the preparation because almost all participants' responses were affirmative. The findings confirm that CPD program has positively impacted the participants' ability to improve their teaching pedagogies. Previous studies (Getenet et al., 2013; Gunnarsdottir, 2014, Zambo & Zambo, 2008) have indicated that CPD programs can enhance the competencies of teachers and improve their profession. When analyzing the professional development journals and interview responses the results somewhat contradicted the SMTFF responses as it was evident that the impact of CPD sessions on teachers' preparations was hardly significant. Although the immediate responses after CPD sessions indicated that CPD improved their competencies but this impact was not evident in practice. The responses of participants indicated that once the content addresses specific issues that are relevant to their experience then the impact will be visible. The literature related to this matter (Goodall et al., 2005; Mansour, Albalawi, & Macleod 2014; Muijs et al., 2004; Sabah et al., 2014) indicates that if CPD activities addresses specific issues that are relevant to participants then this will result in a visible impact.

Third result was related to the appropriateness of the content of the CPD program. It was clear from the SMTFF survey, teachers' reflections and interviews that the most effective activity of CPD was the directly related content that meets individual needs and is aligned with school improvement plan. These findings are expected as they align with previous studies (Goodall et al.,2005; Mansour et al.,2014; Muijis et al., 2004; Sabah et al.,2014) which emphasize the importance of the relevance of the content to the needs of the participants. The teaching methodology workshops were viewed by the interviewed teachers to have the greatest impact on their professional growth and on classroom practices. Teachers showed strong willingness to take risks and try new teaching strategies to enhance their profession and make a difference in their students' learning. This willingness is apparent in many of their responses.

Fourth result was related to the approach used to deliver the CPD content. The approach of CPD program influenced the participants' willingness to reflect about their mathematics pedagogies. Teachers were given voice in the CPD activities and this created an atmosphere of ownership of thoughts, strategies and ideas. The literature related to this issue (Cimer et al., 2013; Hartsell, 2009; Rogers & Horrocks, 2010; Sabah et al., 2014) highlights the importance of the approach that is used in a CPD approach. Participants were not dictated what to do, they were encouraged to consider alternative approaches to current practice such as intervention strategies to enhance learning and make some adaptation for special needs pupils in classrooms. Deeper mathematics knowledge is seen as positively affecting the teaching and learning process. Involvement of teachers in collaborative CPD programs deviate their teaching approaches from teaching by telling into task oriented teaching. Sabah et al. (2014) insist that reflective forms of CPD for mathematics teachers are the most valuable in enhancing teachers' instructional practices. The CPD program provided an opportunity for teachers to come together to design new resources and to draft new schemes of work.

## **Chapter Five: Conclusions, Recommendations, and Limitations**

This research study explored the views held by secondary mathematics teachers on the impact of CPD program on teaching profession and teaching professionalism. It is important to note that continuing professional development program is a vital factor in school improvement, reformation and development. Ozdemir (2013) affirms that professional development is an indispensable element in terms of teacher competence and quality, student learning, school improvement and educational reform. Although there are different features that contribute to the successful implementations of a CPD program, the perceptions of the participants on the impact of the CPD were linked to the relevance of content.

This chapter summarizes the key findings in relation to the research questions of the study. It highlights the key findings of the study, presents recommendations, and limitations that affected the study. Further research possibilities are presented at the end of the chapter.

### **5.0 Key Findings**

All participants clearly articulated their perceptions of the features of an effective CPD. From the analysis of all the multiple sources of data which comprised the SMTEFF questionnaire, teachers' journals, interviews and CPD content, findings on teachers' perception and impact of CPD program can be summarized by three main themes:

- 1- The CPD program provides participants with valuable experiences and knowledge that help them to improve their teaching through collaboration of peers and reflection of their own practices
- 2- The CPD program exposes participants to innovative teaching methodologies and assessment strategies to develop teachers' pedagogical knowledge and improve students' learning knowledge.

3- The CPD program is an opportunity for colleagues in the same discipline to debate with peers, reflect constructively and communicate to build good relationships.

### **5.0.1 Impact of CPD**

The impact of CPD is categorized into two wide clusters, which are behavioural or affective.

#### **Behavioural Impact**

*Teaching:* teachers involved in CPD programs change and develop the aspects of their teaching. CPD helps to embed professional collaboration among the teachers as an on-going approach to professional practice.

*On-going collaborative working:* CPD is a chance for participants to reflect collaboratively with colleagues as an on-going process, whether it is the CPD program or not. Teachers consult each other about the starting point of implementation, pros and cons of new strategies as well as the ways of integrating the ideas into their day-to-day practices.

#### **Affective Impact**

CPD enhances at least one of the affective aspects such as motivation, confidence, attitude, and beliefs. The ultimate goal of CPD is to secure changes in teaching and learning process that will have a direct or indirect positive impact on student learning; the evaluation of the impact of CPD that supports this relationship provides strong evidence. Thus, whilst the participants did not put what they learned into practice, they articulated ways in which they amended new methodologies and strategies in their teaching. It remains the case that actual change in behaviour, measured in terms of changing teaching practice as a result of learning, was very limited.

Regarding teachers' preference in CPD program, teachers had different views depending on their unique experience in the school context. Teachers' perceptions of the effectiveness of CPD program were consistent and almost all of them indicated that the activities were relevant and valuable. At the same time, collaborative form of CPD activities is highly recommended. Factors affecting the implementation of the CPD

activities were mainly resources, school factor and time. School improvement plan is a determinant factor affecting the implementation of CPD activities. Thus, school policies are the most influential factor affecting teachers' preference, participation and their perceptions of the effectiveness of CPD activities.

## **5.1 Recommendations**

Teachers and schools need to understand the vital role that CPD programs play in educational reformation. Schools need to be transparent when providing CPD trainers information about the level of performance of teachers to enable them to design suitable content. The review of school policies and improvement plans should accommodate the resources, manipulative and equipment needed by teachers to implement the promoted ideas in CPD programs. Schools need to ensure adequate materials, resources, and equipment to carry out the new classroom activities and approaches suggested by the CPD programs. CPD affects teaching positively when it includes proper duration, has strong knowledge base grounded in research, is based on collaborative active learning and teaching, and is delivered to a team of teachers preferably teaching the same subject at the same school. CPD improves classroom practice when it includes time for coaching and practice, aligned with local policies, and followed-up continuously. The following are the four main recommendations based on the research study.

### **5.1.1 Develop and Nurture a Positive Attitude to CPD Program**

Participants need time to master the promoted content so that they can develop a sense of ownership to try to apply it. Relevance of CPD program content creates a positive environment marked by enthusiasm to carry on with the change and a commitment to implement the content. Mathematics teachers become active when the CPD program is appropriate to their needs. Suhaili and Khalid (2011) recommend that immersing mathematics teachers within the right kind of professional program results in changing their beliefs and attitudes positively. Negative perceptions may be exacerbated when conducting a CPD program which provides insufficient time for reflections and limited opportunities for discussion.

### **5.1.2 Ensure Collaboration between CPD Trainees and School Principal**

Pre- and post-collaboration between CPD trainers and school leadership team is vital. Lessing and DeWitt (2007) contend that isolated inputs which do not build on one another have little value for those attending the training. CPD trainer has to be familiar with the school culture and the participants' background before the CPD program is hosted. Ndolovo (2013) argues that continuing professional development becomes relevant if it is constantly informed by teachers' needs and perceptions. Supporting Ndolovo's argument, Sabah et al. (2014) stress the importance of collecting information about teachers' needs in the planning process for CPD. Post collaboration provides school leadership team with an idea of what to expect from participants as a result of attending CPD program. Gunnarsdottir (2014) stipulates that professional development planning should be in accordance with the school development plan and in coordination with the Principal to follow up on the implementations. Participants need the support of school leadership team to be able to successfully implement the promoted practices in CPD. McGee et al. (2013) also expound that the impact of professional development should be discussed with school system officials after the PD to enable them to make sound decisions.

### **5.1.3 Recognition of Teachers' Development**

Motivation plays a major role in the process of change. Participants need support, resources and incentives to become motivated to work harder and try new practices. The recognition of developing participants who are determined to take new steps and try out innovative ideas will further motivate them and encourage their peers as well. In Tiruneh et al. (2014) viewpoint, the inconsistent impact of the instructional interventions promoted in professional developments is due to the lack of incentives that acknowledge the participants who are changing. Active participants who are leading the change should be acknowledged by the trainers as well as their school Principal to encourage them to carry on with the new implementations. Such encouragement will motivate other participants who were reluctant to take the same path and start changing. Participants are hesitant to try something new unless it has a positive impact on their appraisal.

#### **5.1.4 Provide Effective CPD Program**

Quality hands-on practical CPD programs create a practical learning environment that attracts participants to engage with the event and leave with valuable ideas. The ingredients of an effective program are relevant content, suitable delivery time, expert trainer who is knowledgeable about teaching practices and constructive feedback and support throughout the sessions. Sabah et al. (2014) describes an effective CPD trainer as one who should be skilled, competent and specialized. The CPD program also needs to encompass a broad spectrum of approaches and activities as appropriate to the purpose of the program. Participants look forward to award-bearing qualifications that are led by experts when taking part in any CPD program. Webster-Wright (2009) asserts that the experiences and contents of the CPD program have a major influence on the learning and development of teachers. Many participants show concern about weak trainers who tend to promote new practices without being able to provide clear guidance to apply them.

#### **5.2 Limitations of the Study**

There were some limitations faced during data collection in this study. With regards to responding to the SMTFF questionnaire, even though the participants were not required to write any personal information about themselves, they were still hesitant about providing honest perceptions. Initially, teachers felt that their responses will not impact the CPD content, however, in the second session when they saw that the comments resulted in content being amended in the second CPD session, they became more confident and honest in their reflections. In addition, some of the CPD content was new to the participants. Learning taxonomies, such as those by Bloom and Fink, teaching strategies and assessment criteria can be considered as trends in education that are not common to all teachers especially those who graduated more than 20 years ago. When they were exposed to these complex terminologies they felt overwhelmed and faced challenges in understanding these concepts to be able to evaluate the CPD content objectively. Math teachers who learned and studied in a traditional way are more likely to teach in the same way that they were taught. Trying new approaches is

possible for them only if they see that what they are doing is not successful. Shriner et al. (2009) believe that teachers will change their pedagogies only when they feel that the information is complete and connected. In addition to the above two issues, there was also a conflict noted between the responses of participants in SMTFF questionnaire when compared to their reflections and interview responses. Although 95% chose 'agree' or 'strongly agree' that the teaching methodologies discussed can be readily put in practice, very few mentioned adapting the teaching methodologies in their journals or interview responses.

### **5.3 Further Research**

This study has several implications for future research in the field of teacher education. CPD is a common method of providing continuing education on new pedagogical practices to improve teaching and learning process. The format of CPD training has many areas for improvement. While measuring the impact of CPD is a key factor in this study, there was a focus on investigating participants' perceptions through interviews. Reflective diaries of participants and interviews provided better understanding of the impact of CPD program which can be an area for investigation in future studies. As mentioned earlier, Johnson and Onwuegbuzie (2004) support mixed methods research as it truly opens up an exciting and almost unlimited potential for future research.

Based on this present study, further research can be done to obtain more valid and up-to-date data on CPD for secondary mathematics teachers. For instance, CPD trainers can use action research to evaluate and enhance their practices, teaching methodologies and assessment strategies. This present study was limited to secondary mathematics teachers. It can be extended by increasing the number of participants and widening the subject to science as well as other subjects.

The impact of CPD would become more relevant if learners are also involved in studies that evaluate effective of PD programmes. Pre- and post-tests can be done to determine improvement in students' performance in formative assessments or in



standardized tests such as TIMSS. Evidence of learner progress can also potentially impact teacher perceptions of CPD and quality of CPD offered.

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## Appendix I: SMTFF Questionnaire

**Kindly indicate the number for each statement below, to show to what extent you agree or disagree.**

1) Strongly Disagree      2) Disagree      3) Agree      4) Strongly Agree

\_\_\_\_\_ 1- I found this workshop to be valuable.

\_\_\_\_\_ 2- The workshop was engaging.

\_\_\_\_\_ 3- The workshop goals were clearly identified and accomplished.

\_\_\_\_\_ 4- The workshop was well organized, well presented and conducted.

\_\_\_\_\_ 5- The workshop content is important to improve students' outcomes.

\_\_\_\_\_ 6- The workshop materials were relevant and appropriate.

\_\_\_\_\_ 7- I learned new skills and strategies that can be readily put to use.

**Kindly write a brief comment for each of the following questions.**

1-What did you find to be most valuable from today's workshop? Why?

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2-What did you learn during this workshop that you are most likely to apply?

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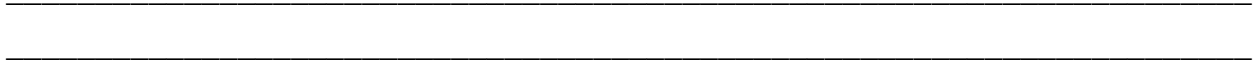
3-How can this workshop be improved?

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4- Additional comments and/or Ideas for future workshops:



## Appendix II: Interview template

Date: \_\_\_\_\_

What is (are) the new implementation(s) that you have done this year as a teacher?

Bulletin Board:

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Preparation:

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Teaching Strategy:

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Others:

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Specify the ideas/strategies/ practices that you found useful and applicable from what we have discussed in the orientation?

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What would be the topic(s) of the coming CPD?

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If you have any concerns/ comments please write them down

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## Appendix III: content of the CPD program

CPD program was designed to assist teachers to implement the new designed curriculum through training, modelling, demonstrating and working collaboratively for a period of six months from April 2014 till September 2014. The content of the CPD programs were listed under five themes as indicated in the table below:

Table XXXX: Content of designed CPD program	
30 hours	
Session	Description
Curriculum Framework (5 hrs)	<ol style="list-style-type: none"> <li>1. Introduction to the workshop. Presentation of working plan and content objectives</li> <li>2. Introduction to the new mathematics curriculum</li> <li>3. Work on practical tasks such as:               <ul style="list-style-type: none"> <li>• differentiate between domain, cluster and standard</li> <li>• identify the difference between content base curriculum and skill base curriculum</li> <li>• compare the NCTM curriculum structure and CCSSM structure</li> </ul> </li> <li>4. discuss of the topic for the lessons that will be taught to deliver the secondary mathematics curriculum</li> <li>5. Autonomous work (collection of material, discuss of pros and cons)</li> </ol>
Scope and Sequence(5 hrs)	<ol style="list-style-type: none"> <li>6. Introduction to the workshop. Presentation of working plan and content objectives</li> <li>7. Discuss the importance of scope and sequence to ensure depth and breadth of curriculum</li> <li>8. Work on practical tasks such as:               <ul style="list-style-type: none"> <li>• Illustrate the general format of scope and sequence and of progressive skills</li> <li>• Identify the resources for teaching selected standards</li> </ul> </li> <li>9. Plan group work tasks to link the curriculum standards to</li> </ol>

	<p>the selection of resources and design the appropriate time frame to produce the scope and sequence</p> <p>10. Short presentation of the group proposals to the other participants</p>
<p>SMART Learning Outcomes(5 hrs)</p>	<p>11. Introduction to the workshop. Presentation of working plan and content objectives</p> <p>12. Specify the criteria of a SMART learning outcome</p> <p>S: Specific</p> <p>M: Measureable</p> <p>A: Attainable</p> <p>R: Realistic</p> <p>T: Timely</p> <p>13. Evaluate a set of learning outcomes to determine if they are SMART or not.</p> <p>14. Compose SMART learning outcomes that reflect the set skills and standards specified in the secondary mathematics curriculum</p> <p>15. Distribution of tasks to be done among members of group</p> <p>16. Short presentation of the group proposals to the other participants</p>
<p>Teaching Methodologies(5 hrs)</p>	<p>17. Introduction to the workshop. Presentation of working plan and content objectives</p> <p>18. Analyse data collected from classroom related to teaching methodologies used and classify them (direct, indirect, experiential, independent)</p> <p>19. Identify the difference between inquiry based learning, problem based learning and explicit teaching by highlighting on students role in the teaching and learning process</p> <p>20. Discuss the modification to make in the lesson plan, tasks</p>

	<p>and materials to be used in view for the future classroom</p> <p>21. Distribution of tasks to be done among members of group</p> <p>22. Short presentation of the work carried by group</p>
<p>Assessment Strategies(5 hrs)</p>	<p>23. Introduction to the workshop. Presentation of working plan and content objectives</p> <p>24. Define the three types of assessment types: pre-assessment, formative assessments, summative assessments</p> <p>25. Produce a list of formative assessments based on data collected from classrooms</p> <p>26. Discuss the modification to make in the lesson plan, tasks and materials to be used in view for the future classroom</p> <p>27. Distribution of tasks to be done among members of group</p> <p>28. Short presentation of the group proposals to the other participants</p>