THE QUALITY OF A MATHEMATICS TEACHER TRAINING PROGRAMME AT THE SPECIALISED INSTITUTE FOR PROFESSIONAL TRAINING OF TEACHERS IN OMAN

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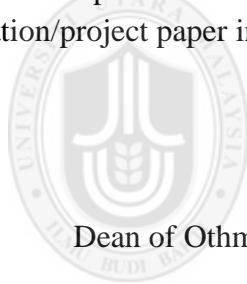
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Abstract

The Ministry of Education (MOE) in Oman provides many in-service training opportunities to teachers in all subject areas. One of the educational institutions that provide teacher training programs in this country is the Specialised Institute for Professional Training of Teachers. This study investigates trainees' perceptions of factors influencing the quality of mathematics teacher training programmes (context, administration, training design, training content, facilities, trainer's competencies, trainees' characteristics, delivery, trainer's follow-up, and feedback, and perceived outcomes). This qualitative case study is guided by the CAIPO (Context, Administration, Input, Processes, and Outcomes) training evaluation model. Mathematics trainee teachers from public schools in the first and second cohorts at the SIPTT were recruited as research subjects. Twelve individual semi-structured interviews were conducted among 433 Mathematics trainee teachers from public schools in the first and second cohorts at the SIPTT who attended the programme. Data were analysed through coding and thematic analysis. The trustworthiness of the findings was enhanced by triangulation, quotes from participants, data recording, and member checking. The participants indicated that the Mathematics teachers training program was of quality in terms of supportive school environment and professional learning communities in the context theme, training design, training content, facilities, trainer's competencies, trainees' characteristics in the input theme, delivery, trainer's follow-up and feedback in the process theme, and perceived positive outcomes. They also reported several policies and procedures challenges in the administration theme. This study advances existing research by determining key indicators of training programme quality using CAIPO's training evaluation model. Practically, the findings provide decision-makers at the MOE in Oman with important insights on how to improve educational training programme quality, especially for mathematics teachers. Future research could consider the investigation of other factors in Omani school environment to identify its role in influencing SIPTT training quality.

Keywords: training evaluation, training quality, mathematics teacher training, CAIPO training evaluation model.
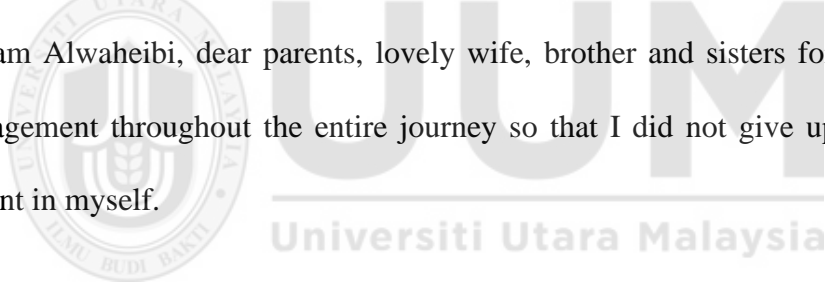
Abstrak

Kementerian Pendidikan (KPM) di Oman menyediakan banyak peluang latihan kepada guru dalam perkhidmatan dalam semua bidang mata pelajaran. Salah sebuah institut pendidikan utama yang menyediakan program latihan kepada guru di negara ini ialah Institut Khusus Latihan Profesional Perguruan (SIPTT). Kajian ini menyiasat faktor-faktor yang mempengaruhi kualiti program latihan guru matematik (konteks, pentadbiran, reka bentuk latihan, kandungan latihan, kemudahan, kecekapan jurulatih, ciri-ciri pelatih, penyampaian, susulan dan maklum balas jurulatih, dan tanggapan hasil) daripada persepsi pelatih dengan menggunakan. Kajian kes kualitatif ini adalah berpandukan model penilaian latihan CAIPO (Konteks, Pentadbiran, Input, Proses, dan Hasil). Guru pelatih matematik dari sekolah awam kohort pertama dan kedua di SIPTT telah diambil sebagai subjek penyelidikan. Dua belas temu bual individu separa berstruktur telah dijalankan dengan 433 orang guru Matematik pelatih dari sekolah awam di kohort pertama dan kedua di SIPTT yang menghadiri program tersebut. Data dianalisis melalui pengkodan dan analisis tematik. Kebolehpercayaan dapatan kajian ditingkatkan dengan menggunakan triangulasi, petikan respon peserta, rakaman data, dan semakan ahli. Peserta kajian menyatakan bahawa program Latihan Matematik berkualiti dari segi persekitaran pekerjaan yang menyokong dan komuniti pembelajaran professional dalam tema konteks, reka bentuk latihan, kandungan latihan, kemudahan, kecekapan jurulatih, ciri-ciri pelatihn dalam tema input, penyampaian, susulan dan maklum balas jurulatih, dan dalam tema proses dan tanggapan hasil yang positif. Mereka juga melaporkan beberapa cabaran dasar dan prosedur dalam tema pentadbiran. Kajian ini memajukan penyelidikan sedia ada dengan menentukan petunjuk utama kualiti program latihan dengan menggunakan model penilaian latihan CAIPO. Secara praktikalnya, dapatan kajian ini memberikan pandangan penting tentang cara meningkatkan kualiti program latihan pendidikan, terutamanya untuk guru matematik kepada para pembuat keputusan di KPM di Oman. Penyelidikan masa hadapan boleh mempertimbangkan penyiasatan faktor lain dalam persekitaran sekolah Oman bagi mengenal pasti peranannya dalam mempengaruhi kualiti latihan SIPTT.

Kata kunci: penilaian latihan, kualiti latihan, latihan guru matematik, model penilaian latihan CAIPO.

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List of Abbreviations

CIPP Context, Input, Process, Product.

CIRO Context, Input, Response, Outcome.

HRD Human Resource Development.

IPO Input, Process, Outcome.

MOE Ministry of Education

ROI Return On Investment.

SIPTT Specialised Institute for Professional Training of Teachers

CHAPTER ONE

INTRODUCTION

1.1   Background of the Study

Training of employees is essential for organisational effectiveness. Through training, employee skills and knowledge can be updated and enhanced, contributing to the sustainability of the organisation. In the context of educational institutions in the Sultanate of Oman, educational training is needed to develop teachers' knowledge, skills, and abilities (Al-Jabri et al., 2018). The Ministry of Education (MOE) provides many in-service teacher training opportunities. One of the key organisations that provide training programmes to teachers in the country is the Specialised Institute for Professional Training of Teachers (SIPTT), which was established in 2014 in alignment with the Omani Vision 2020 (MOE, 2014). Consistent with Vision 2020, the new Omani education vision 2040 sheds light on the necessity of developing human resources, which should be a major priority in all plans and programmes (Oman Education Council, 2018).

The main aim of SIPTT is to lead the development of the Sultanate's teachers in the transition to world-class performance (MOE, 2014; Oman Education Council, 2018). It was established specifically to address the following issues: (a) to find out the critical requirements of Oman's education system, (b) to explore the types of approaches needed to improve the pupils' learning quality, and (c) to understand how to increase the measure of learning outcomes through the professional development of the education workforce (Al-Shabibi & Silvennoinen, 2017). Notably, the SIPTT's role is also to develop some comprehensive mechanisms and plans for training and monitoring teachers' performances in education (Al-Jabri et al., 2018). Fundamentally, these training programmes aim to improve the teachers' confidence, motivation, and skills to a level that meets the highest standards so that student learning outcomes are enhanced

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(MOE, 2014). Evidence shows that an effective training programme facilitates the improvement of organisational deficiencies (Shenge, 2014).

The SIPTT is well-equipped with the relevant infrastructure to facilitate the learning and development of teachers. It has 56 training classrooms, a science laboratory, a library, a restaurant, and meeting rooms. It is also equipped with professional training equipment for those who are involved directly in the classroom learning process (e.g., supervisors, teachers, school principals, and their assistants). It has 97 Omani trainers who deliver the training programmes with constant support from local and international experts, who also help develop the training materials. Participants follow a one-year programme that leads to a higher education certificate or a two-year programme, leading to a professional higher education diploma.

The SIPTT programmes are designed to meet the following priorities for Omani students. The teacher training programmes focus on (a) teaching subjects and topics that are important to the future Omani economy, including mathematics, (b) teaching subjects in which international studies compare students' performance in different countries, (c) targeting all schools and a large number of teachers, so changes have a significant effect, and (d) avoiding repetition with other programmes and projects conducted by the MOE. The following values have been implemented as a basis for the programme design to ensure that the SIPTT training programmes have a direct effect on student achievement:

a) Sustained: A two-year programme to embed attitudes, knowledge, and skills.
b) Comprehensive: A high proportion of principals, assistant principals, teachers, and supervisors from selected subjects and specialities and participation by all schools.

c) Integrated: Face-to-face training utilising online learning and a wide variety of active learning strategies to encourage participants to engage with SIPTT and workplace training, delivering practical opportunities to improve skills and embed practice.

d) Coherent: Developed using different research methods and international best practices containing all Ministry initiatives and priorities.

e) Supported: Through monitoring, on-going contact, and evaluation by trainers.

The SIPTT supports trainees through ongoing communication with the SIPTT trainers and the provision of technical support and feedback through the e-learning platform, regional visits, and provision of a tablet computer for e-learning. To support workplace learning, the MOE provides pre-paid internet services. To complete their learning activities, trainees are not required to attend their offices or schools on the study day. Management support is a critical issue in the transfer of learning at the workplace. Many empirical studies have revealed the significance of the role of management in the training function (Rajasekar & Khan, 2013). Additionally, the SIPTT provides accommodation, transportation, and other services free of charge for the trainees. From the SIPTT establishment in 2014 until 2020, it has trained up to 787 educational leaders, 504 supervisors, 2573 senior teachers, and 5312 new teachers (SIPTT, 2021). The training programmes currently available in SIPTT are shown in Table 1.1.

Table 1.1
Training Programmes in SIPTT (2014-2021).

No.	Participants	Type	Duration
1.	School leaders	Compulsory	2 years
2.	Supervisors		
3.	Senior teachers		
4.	Mathematics teachers (Grade 5-10)	Voluntary	
5.	Science teachers (Grade 5-10)		
6.	Arabic teachers (Grade1-4)		
7.	Field 2 teachers (Grade 1-4)		2.5 years
8.	English teachers (Grade 1-12)		1.5 years
9.	New teachers	Compulsory	1 year

Source: SIPTT (2021).

1.2   Mathematics Teachers Training at the SIPTT

As explained later, of the nine types of participants shown in Table 1.1, the present study focuses on mathematic teachers.

SIPTT offers a two-year mathematics voluntary diploma training programme to mathematics teachers to improve the mathematics education learning outcome in Oman. The objective of this programme is to enhance the teachers' learning and teaching capabilities so that they could be groomed as programme leaders in mathematics. The mathematics teachers training programme structure is divided into four modules to be completed within two years, as shown in Table 1.2. The training programme is expected to increase the teachers' motivation and create enthusiasm for teaching mathematics. With the teachers' improved skills, students' performance in mathematics and the development of students' mathematical skills could be enhanced (Alamri et al., 2018).

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Table 1.2
Mathematics Training Modules (2014-2021)

Module	Description and Purpose
One	Principles and characteristics of professional practices for teaching mathematics. This training period enables participants to work on evaluating the stages of development of the educational system in the Sultanate of Oman and analyse the main actions to improve learning outcomes. Participants are introduced to a number of new strategies in teaching and learning and are asked to evaluate the impact of implementing these strategies. It also enables them to think critically, evaluate their educational practices, and plan professional development programmes.
Two	Systematic learning based on clear instructions. Participants continue to develop their knowledge and try new strategies in mathematics education by focusing on clear and structured instructions provided to the student and on constructive games and competitions. This training period also focuses on the importance of employing technology, as it provides participants with knowledge and skills to use in teaching, and in developing students' thinking skills. Participants work with a small group of colleagues to apply and develop the strategies they have learned and to evaluate the impact of their implementation.
Three	Problem-solving strategies in mathematics. This training period aims to enable participants to apply new methods in the classroom such as problem-solving, the think-aloud strategy, individual differences and hard-to-teach topics in mathematics, underachievement plans, performance, and assessment tasks. It also aims to engage the local community in order to improve teaching and learning in school.
Four	New methods of teaching mathematics. Participants continue to develop their knowledge and experience of new strategies in mathematics education such as project-based learning and technology use and ways to develop mathematics skills in student communication. This training period also focuses on the work that mathematics teachers must do with their schoolmates in order to improve learning outcomes.

Source: SIPTT (2019).

The SIPTT mathematics teachers training programme is voluntary and targeted at mathematics teachers in grades 5-10. The mathematics teachers training programme delivers investigative learning techniques, research methods, and the implementation of mathematical concepts. Despite being voluntary, participant recruitment targets are based on the strategic model of SIPTT. The targets are designed to build a cohort of teachers in each school who have completed the SIPTT programmes and can work with and support each other in driving school improvement. In 2018, the SIPTT recruitment plan targeted 722 mathematics teachers from grades 5-10. The target represented approximately 15% of the mathematics teachers in the Sultanate (SIPTT,2021). To date, the SIPTT has trained three cohorts: 365 trainees in the first cohort (2014-2016), 70 in the second cohort (2016-2018), and 34 in the third cohort (2018-2020) (SIPTT, 2021).

The mathematics teachers training is a blended programme where each module contains three components: (a) 22.5 hours of face-to-face training in five days (30%), (b) online training (20%), and (c) workplace task application (50%). Each component of each module assesses the mathematics trainee teachers. Each training module is evaluated by submitting an achievement file that contains samples of the teacher's work and a comprehensive report on all unit elements. The materials in the portfolio include study plans, educational resources, professional development activities, and educational films that were used for assessment and feedback from students and fellow teachers. The report consists of 5,000 words, focusing specifically on the content of the training module. Participants must demonstrate their analysis, evaluation, and reflection skills and relate their work to local examples and research evidence. The trainees must score at least 50% marks in the overall result to get a diploma. Figure 1.1 shows the mathematics training structure in each module.
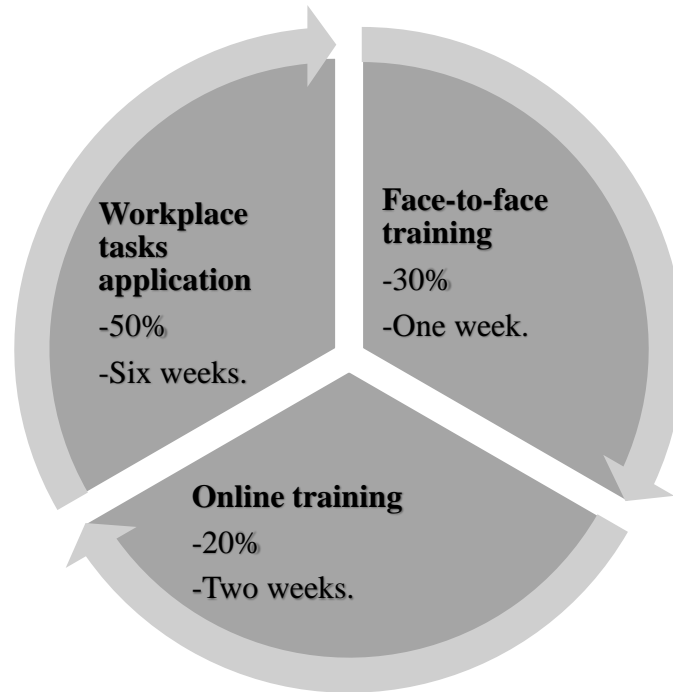
Figure 1.1
Mathematics Teachers Training Module Structure in the SIPTT
Source: SIPTT (2021)

1.3   Problem Statement

Despite the resources expended toward the mathematics training programmes offered by MOE and

organised by SIPTT, the programmes appear to be ineffective in meeting the objectives of

enhancing students' performance in mathematics. Firstly, Omani students' performance in

mathematics is not encouraging, as evident from the Trends in International Mathematics and

Science Study (TIMSS), organised by Boston College to provide reliable and timely data on

students' achievement in mathematics and science across many countries (International

Association for the Evaluation of Educational Achievement [IEA], 2019). TIMSS is known as an

international assessment of mathematics and science conducted at the fourth and eighth grades

implemented every four years since 1995. TIMSS has been recognised globally as an essential

indicator of the advancement of the teaching of mathematics (Al-Balushi et al., 2015). However,

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in 2007, 2011, and 2015 the TIMSS results indicated that Omani students' assessments remained unsatisfactory, particularly in mathematics (AlMaskari et al., 2016). For instance, Omani 8th-grade students' achievements were far behind compared to students from different nations who took part in 2019 (Mullis et al., 2019) (see Table 1.3).

Table 1.3
Grade 8 Mathematics Performance in TIMSS (2007-2019)

Year	2007	2011	2015	2019
Eighth grade	372	366	403	411

Source: Mullis et al. (2019)

IEA's TIMSS 2019 is the seventh assessment in the TIMSS series that aims at overseeing 24 years of educational excellence. It also provides complete data on students' learning outcomes in mathematics and science. In 2019, 64 countries and eight benchmarking entities (regional jurisdictions of nations, including states or provinces) joined the TIMSS. In total, 250,000 students from 8,000 schools and 30,000 teachers participated in the eighth-grade assessment (Mullis et al., 2019) constructed on all-inclusive frameworks formulated in cooperation with the participating nations. Across the globe, the highest score was achieved by students from Singapore. Singaporean students in grade eight obtained a score of 616 (Mullis et al., 2019). As shown in Table 1.3, for instance, although the absolute score in mathematics obtained by Omani students in grade eight went up, particularly from the year 2011 to the year 2019, overall, the Omani students' score remains below the centre point, which was 500.

Secondly, the success rate of mathematics teacher trainees attending the SIPPT mathematics programmes is the lowest compared to other trainees in other SIPTT programmes since its establishment in 2014 (see Figure 1.2). To reiterate, to complete the programme successfully, trainees should obtain a total score of at least 50%. Figure 1.2 shows that the first cohort (2014-2016) scored slightly higher than 50%, and the second cohort (2016-2018) scored higher but not

significantly higher than the score of the first batch at around 60%. In comparison, the scores of the first and second cohorts of Arabic and Science teachers were higher than those of the mathematics teachers in both cohorts.
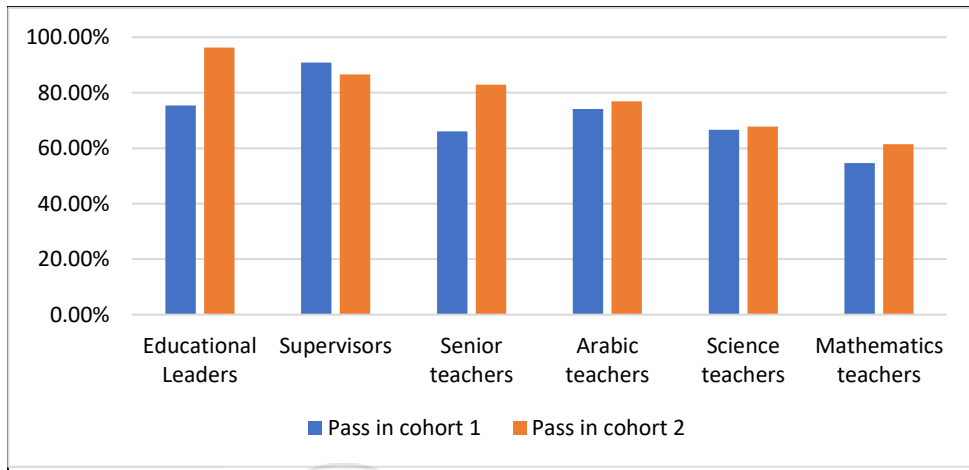
Figure 1.2
SIPTT Training Results of the First Cohort (2014-2016) and the Second Cohort (2016-2018)
Source: SIPTT (2021).

Thirdly, in comparing between the first and second cohorts of the mathematics teacher trainees' performance, another stark picture emerges, particularly with respect to the number of trainees who withdrew from the programme and the number of participants in the second cohort. Unfortunately, the number of those who passed went up, and those who failed the programme went down. However, the number of teacher trainees who withdrew from the programme increased (refer to Table 1.4). That is, not *all* trainees completed the programme as expected. Such a withdrawal from the programme was unanticipated because participation in the programme is voluntary. Also, by completing the training programme, the trainees are expected to be the nucleus for a change in the practice of teaching mathematics and consequently in students' achievement in mathematics. On a personal level, the trainees will receive a professional diploma, which means more opportunities for career growth.

Table 1.4
Performance of Mathematics Teacher Trainees for First and Second Cohort

| | Cohort 1 (2014-2016) | | Cohort 2 (2016-2018) | |
	Count	**%**	**Count**	**%**
Passed	199	54.9	43	61.4
Failed	135	37.1	21	30.0
Withdrew	29	8	6	8.6
Total	363	100	70	100

Source: SIPTT (2021).

Not only were the mathematics teachers training results (i.e., scores) and the withdrawal of the first and the second cohorts discouraging, there was a significant decrease in voluntary participation of mathematics teachers in the second cohort (2016-2018) from 363 to 70 only (see Figure 1.3), which was in contrast with the targeted number (i.e., 722) in the SIPTT strategic plan (SIPTT, 2021). Even though many factors could contribute to the decline, the lowest scores achieved by the mathematics teacher trainees, the increasing number of the mathematics teacher trainees who withdrew from the programme, and the severe decrease in the participation of the mathematics teachers training programme also raise an essential question regarding the quality of the programme offered by the SIPTT.
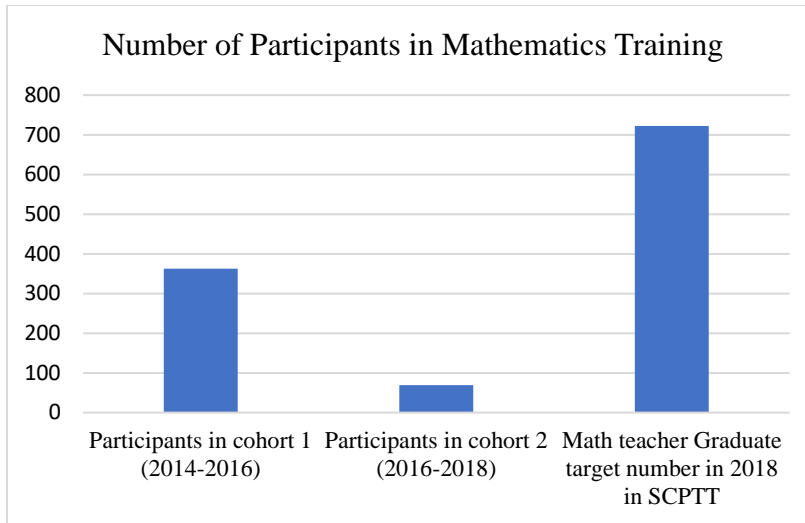
Figure 1.3

Comparison of the Size of First and Second Cohort and the Targeted Number of Graduates in Mathematics Teachers Training in 2018

Source: SIPTT (2021)

One of the critical concerns in training provision is the training quality so that the possibility of change exists (Rajasekar & Khan, 2013). According to Beardwell and Thompson (2017), training quality is a critical factor in achieving an organisation's strategy. Enhancing the quality of training practices by practitioners is a possibly reliable driver of beneficial change (McChesney & Aldridge, 2018). However, frequently, organisations fail to determine the quality of their training programmes despite the high spending on training every year (Singh et al., 2015). Past studies on teacher professional development programmes reported disappointing results in terms of the quality to help teachers improve teaching practices and even more disappointing results in terms of their effect on learning and achievement of students (Cave & Brown, 2010; Desimone & Garet, 2015; Garet et al., 2011; Lipowsky & Rzejak, 2015; Yoon et al., 2007). In the case of Oman, as indicated earlier, the challenge is to determine whether the mathematics teachers training programme provided by the SIPTT could elevate the quality and level of mathematics of students

across the Sultanate. Addressing the training quality issue is critical for any country, such as Oman, in meeting the national agenda of educational progress and development in the long run.

The quality of training programmes is critical for successful trainee performance (Carlisle et al., 2019; Huang et al., 2014). However, there is little evidence indicating that the training programmes by SIPTT have achieved the desired result in enhancing the performance of the mathematics teacher trainees. Any issues found regarding the quality of mathematics teachers training at SIPTT may carry over to the larger population of over 6,000 trainees in other training programmes in SIPTT. Hence, it is critical that a study be conducted to address the issue of training quality offered by the SIPTT.

Studies on training evaluation revealed that most Gulf countries, including Oman, have difficulty evaluating training (Al-Mughairi, 2018). In Oman, this occurs despite spending approximately USD156 million on the development activities in the MOE, including training programmes (MOE, 2018). One of the reasons could be several crucial discrepancies between theoretical conceptualisations and empirical operationalisation of training criteria that have hindered advancement in training evaluation (Sitzmann & Weinhardt, 2019). Moreover, the training evaluation processes in Oman are simply done to see trainees' reactions to the programmes without centring on the quality of the training programme in attaining the projected goals (Al-Nabhani, 2007). Overall, the information on the training quality has been scant regardless of the substantial utilisation of resources in-service teacher training programmes (Arancibia et al., 2016), and it is often reported that most recent teacher training programmes are over-theoretical and outdated (Loyalka et al., 2019). Simultaneously, many evaluations fail to offer adequate details on the actual content or delivery mechanisms of the training to notify the design of successful programmes (Loyalka et al., 2019).

Although several studies on training evaluation have been conducted in Oman (Alaraimi & Othman, 2015; AlBalushi, 2018; Al-Hosni, 2014; Al-Jabri et al., 2018; Al-mughairi, 2018; Al Tuwairishi et al., 2021; Al-Omrani, 2014; Alshykairi, 2020; SIPTT, 2020; Rajasekar & Khan, 2013), little academic attention is given to trainees' perceptions of non-mandatory mathematics teacher training programme. This is perhaps because most mathematics teachers training programmes in Gulf countries are not subject to any type of evaluating training quality (Alamri et al., 2018), resulting in scare research works. Therefore, the present study attempts to understand mathematics trainees' perceptions about the quality of mathematics teachers training programme of the SIPTT by using a qualitative approach guided by the Context-Administration-Input-Process-Outcome (CAIPO) training evaluation model to get a comprehensive and in-depth understanding of the issue. Qualitative research methods are widely used in policy evaluation (Spencer et al., 2004). The trainees' view facilitates decision makers to select an effective training package. In addition, their response can define whether the training programmes have accomplished their objectives and identify the changes needed to improve the programme content, design, and delivery.

The SIPTT distributes periodic questionnaires to evaluate the trainees' reaction levels. The results tend to indicate excellent mathematics teachers training (see Table 1.5). Despite the favourable assessment, it does not explain (a) the lowest success rate in the mathematics teachers training programme in the first and second cohort among the rest of SIPTT trainees (see Figure 1.2), (b) the low participation number (see Figure 1.3), and (c) the continued withdrawal from the programme (see Table 1.4), which begs the question about the validity of the quantitative method in investigating training quality.

Table 1.5

Mean Ratings of Different Facets of Mathematics Teachers Training Programme in Cohort 1&2

Facets	Cohort 1	Cohort 2
Administrative organisation	4.28	4.14
Training content	4.37	4.35
Trainer competencies	4.81	4.75
Learning	4.67	4.49
Overall/Average	4.53	4.43

Source: SIPTT (2021)

1.4   Research Questions

The present study is interested in understanding the quality of the mathematics training programme offered by the SPITT, specifically through the lens of the trainees. Concerning this issue, the current study makes an attempt to address the following key research questions:

1. What key indicators do trainees perceive as being the strengths of the mathematics teachers training programme in SIPTT?

2. What key indicators do trainees perceive as being the weaknesses of the mathematics teachers training programme in SIPTT?

3. What are the main indicators for evaluating the quality of the training program at the SIPTT?

1.5   Research Objectives

Consistent with the questions posed above, the specific objectives of the current study are as follows:

1. To determine the strengths of mathematics teachers training in SIPTT from trainees' perspective.

2. To identify the key indicators perceived as weakness of the mathematics teachers training programme in SIPTT by the trainees.

3. To recommend the main indicators for evaluating the quality of the training program at SIPTT.

1.6   Scope of the Study

There are many public training centres in Oman. The present study primarily focuses on investigating the quality of the two-year mathematics teachers training programme for teachers provided by the SIPTT.[1] The mathematics teachers training success rates of 54.7% in the first cohort and 61.4% in the second cohort were the lowest success rates among other similar training programmes. In addition, the continued withdrawal from the programme and the declining number of volunteering teachers in the second cohort are the key issues to be explored. Consistently, the study seeks to investigate trainees' perceptions about mathematics teachers training quality guided by the Context-Administration-Input-Process-Outcome (CAIPO) evaluation model (Easterby-Smith, 1994). This study used a systematic evaluation approach since training is not a simple cause-and-effect relationship (Wills, 1994) .

The quality of mathematics teachers training programme is achieved when trainees are satisfied with the instructional experience, enhance their knowledge and skills, and increase their motivation (Sitzmann et al., 2008). This study considered trainees who passed, failed, and withdrew from the programme in the first and second cohorts as the research subjects. By comparing these groups, the present study hopes to understand the trainee's perception of the quality of the programme. The findings could also be used to anticipate the decline in participation of future trainees.

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[1] Before the SIPTT establishment in 2014, mathematics teachers received training from the MOE in their respective governorate. Mathematics teachers receive short-term training (e.g. workshop) within less than one week and no practical training tasks in the school is required.

To meet the research objectives, the researcher used a qualitative method where in-depth online interviews. The in-depth interviews were carried out to identify the factors at each level (Context, Administration, Input, Process, and Outcome) the trainees perceive to be relevant in enhancing the quality of the mathematics teachers training programme.

1.7   Significance of the Study

In Oman, as in many other countries around the globe, high priority is given to improve teachers' performance. The consideration of teachers' practice is supported by the belief that teaching quality is crucial to enhancing students' achievement and developing Oman educational system (MOE & World Bank, 2012). Therefore, the MOE has made enhancing teachers' professional practices a strategic objective and a fundamental component in planning the most current training practices (Alshandudi, 2017).

The current study has both practical and theoretical significance. Concerning the practical importance, the study findings offer insights into the quality of the mathematics teachers training programme conducted by SIPTT. An evaluation of the training influence is the process of diagnosis and evaluating the overall processes of the programme (Park et al., 2017). Feedback from the assessment data can then be used to inform decision-makers so that training choices can be made as well as the efforts made to further improve the training system (Goldstein & Ford, 2002). Investigation training quality is critical to ensure that the Omani teachers are capable of competing internationally (Oman Education Council, 2018). Findings from numerous worldwide evidence-based studies have shown that training for in-service teachers can have positive influences on the teachers' professionalisation development and students' learning achievement (Lipowsky & Rzejak, 2015).

It is crucial to focus on the stakeholders' needs when assessing any training programmes to fulfil training quality (El Hajjar & Alkhanaizi, 2018). Hence, the identification of trainees' perceptions about the SIPTT mathematics teachers training quality is critical. This is an important first step to help practitioners understand the strengths and weaknesses of the training programme so that they can formulate a suitable plan to address common challenges faced by mathematics teachers in Oman and other developing countries. Increasing the quality of training can directly support employee's awareness of the aims of training courses, training continuity, training implementation in the workplace, and accurate application of the programme (Al-Hosni, 2014). Furthermore, a well-planned, designed and implemented training will assist trainees' involvement and attitudinal changes, and this offers an opportunity to apply new knowledge and skills in the workplace (Farjad, 2012).

The assessment data could also recognise the limitations of the results in enhancing training programmes and form superior accountability between stakeholders for the training outcomes (Saks & Burke, 2012). This research, therefore, offers practical recommendations to policymakers in public education and SIPTT, particularly the requirements for enhancing the quality of the training programmes in the mathematics subject. Studying training quality results could assist in (a) formative programme improvement and learning; (b) overall summative judgment; (c) development of the programme to adapt to emerging, dynamic, and complex conditions; (d) knowledge generation to increase general understandings and recognise common effectiveness principles; (e) accountability; and (f) monitoring (Newcomer et al., 2015).

Furthermore, evaluating training quality is essential to justify further investment in training teachers in the country. Given the importance of professional training in the SIPTT, evaluating training to confirm its quality is a pressing, continuing need (Ritzmann et al., 2014). So, the SIPTT

can genuinely determine if its training is efficient, effective, and meeting the MOE needs. The attention of the Omani government to training has been revealed in developing policies, setting legislation, and upgrading programmes and institutions (Oman Education Council, 2018). Training is expected to increase human, technical, managerial, and conceptual competencies for the maintenance of individual, organisational, and national growth (Kester & Oludeyi, 2017). In the case of mathematics teachers training programmes, their quality could help the country deliver the National Strategy for Education 2040 (Oman Education Council, 2018).

Theoretically, the present research is expected to contribute to a comprehensive understanding of the current training practices in SIPTT for mathematics teachers and improve several indicators of the quality components and procedure based on the CAIPO model (Easterby-Smith, 1994). Practitioners can adopt a systematic and logical evaluation approach to attain the needs of individual and organisational circumstances (Griffin, 2010). The research result contributes to theory by enhancing Easterby-Smith's (1994) existing model of evaluating training quality and contributes to practice by offering a useable and applicable evaluation framework that suits the SIPTT context in particular. Determining quality indicators in SIPTT training programmes is significant in presenting possible solutions to poor training outcomes. The research questions are valuable for investigating gaps existing between the process, role, and usefulness of in-service training activities in SIPTT, which can help define how well SIPTT policies and programme inputs are being provided and how efficiently they are used concerning stated aims.

1.8 Definition of Key Terms

Training is described as a scheduled procedure to change attitude, knowledge, behaviour, or skill via learning experiences to achieve productive performance in an activity (Masadeh, 2012). In a

work scenario, the aim is to develop the learners' potential and meet the organisation's latest and future requirements (Milhem et al., 2014).

Training evaluation is an analytic method to facilitate the amendment of a programme to fulfil several aims. The collected data can be applied to choose or modify the programme (Mann, 1996).

Training quality refers to the "fitness for purposes" (Campell & Rozsnayi, 2002, p. 19). This approach requires that the service (i.e., mathematics teacher training) has conformity to trainee needs, requirements, or desires. This study adopts this definition to evaluate training quality that should consider the context, administration, input, process, and outcomes of training. From the perspective of the mathematics teachers training programme offered by SIPTT, training achieves quality when trainees are satisfied with the instructional experience, administration procedures, enhance their knowledge and skills, and increase their motivation (Sitzmann et al., 2008). Evaluating the quality of training benefits the organisation by identifying why individuals learned or did not learn (Alvarez et al., 2004). Take note that this study does not intend to measure student performance but instead focus on the quality perception of teachers, hoping that such perception will result in positive student performance through enhanced competency, skills, and knowledge of mathematics of teachers.

Mathematics teachers training is a non-mandatory training course conducted by SIPTT within two years to impart, instil, improve, or reinforce knowledge, skills, or personal qualities which are likely to be helpful to the mathematics teachers when performing his/her duties.

Face-to-face training is a training session conducted by a trainer in a non-online, non-virtual, classroom setting whereby both the trainer and trainees are physically in the same room at the same time (Spencer, 2016).

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Online training is "learner-centred, which allows learners more control with course pacing, sequencing and styles" (Bartley & Golek, 2004, p. 170).

Workplace task applications are defined as the degree to which trainees effectively apply the attitudes, skills, and knowledge gained during their participation in a training programme to their jobs (Diamantidis & Chatzoglou, 2014).

Perception is defined by Bratton (2015) as "the process of selecting, organising and interpreting information to make sense of the world around us" (p. 125).

1.9 Organisation of Thesis

The first chapter illustrates the research background, problem statement, research questions, study objectives, research scope, the study significance, and definition of the key terms.

The second chapter reviews the previous literature related to training, influencing factors of training, training evaluation, evaluation models, comparison of these evaluation models, and the conceptual research framework.

The third chapter demonstrates a research philosophy, study paradigm, study design and approach. This chapter explains the case study qualitative approach to answer the questions of the research and meet the research objectives. Methodological issues related to the qualitative approach, such as sampling, data collection, and data analysis, will also be discussed.

The fourth chapter shows the findings of this study. The fifth chapter will discuss in detail the qualitative findings. The final chapter will summarise the research results, limitations, recommendations, and conclusions of the research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews the pertinent previous literature on training and its related aspects. First, it conceptualises and defines the concept. Then, it looks at various factors that influence training, then discusses several training evaluation models and compares them. Finally, the chapter finishes with a conceptual qualitative evaluation framework based on the Context-Administration-Input-Process-Outcome (CAIPO) model.

2.2 Training and Training Quality

Training is an essential practice in most organisations to achieve the desired goals. Training is defined by Manpower Services Commission (1981, as cited in Beardwell & Claydon, 2004) as a scheduled process used to modify knowledge, skills, and behaviour or attitudes through the learning experience to attain efficient learning performance in a variety of activities. In the job context, its aim is to improve the capabilities of people and fulfil the present and future needs of the organisation. This description links training and scheduling processes with training as a scheduled operation to adjust the gained skills by applying education and experience. Training is a continuing planned process that replicates several phases involved in the task to accomplish the projected value (Milhem et al., 2014). Similarly, Bramley (2003) delineates training as "a process which facilitates learning so that people can become more effective in carrying out their work" (p. 4). In a similar vein, Ghosh et al. (2011) stated training as an influential process of participant's behavioural change.

In this study, training is described as a scheduled procedure to change knowledge, skill, attitude or behaviour via learning experiences to attain productive performance in an activity (Masadeh, 2012). In a work scenario, the aim is to form the learners' potential and meet the organisation's latest and future requirements (Milhem et al., 2014). In the current study, training is a scheduled intervention designed to improve the job performance of mathematics teachers. Through such training, the trainees will learn about new teaching strategies and ways to teach the curricula or identify deficiencies in teaching and learning the subject with the ultimate aim to enhance students' performance in mathematics. It is stressed here that the present study does not aim to measure students' performance in mathematics, nor does it intend to measure trainees' performance in the training programme. It is specifically interested in examining the quality of the mathematics training programme offered at SIPTT from the trainees' perspectives, with the expectation that the insight into the factors that contribute to the training quality could result in enhanced training performance and spill over to enhanced student performance in mathematics.

As mentioned in chapter one, the present study defines training quality as "fitness for purposes" (Campell & Rozsnayi, 2002, p. 19). This approach requires that the training programme (i.e., mathematics teacher training) conforms with trainee needs, requirements, or desires. This study adopts this definition to evaluate training quality that should consider the context, administration, input, process, and outcomes of training. That is, from the perspective of the mathematics teachers training programme offered by SIPTT, training achieves quality when trainees are satisfied with the instructional experience, administration procedures, enhance their knowledge and skills, and increase their motivation (Sitzmann et al., 2008). Evaluating the quality of training benefits the organisation by identifying why individuals learned or did not learn (Alvarez et al., 2004). The present study speculates that when the trainees perceive the training

programme to be of quality (i.e., fit for purposes), they are likely to achieve a higher score compared to other trainees in other training programmes, stay and complete the programme, and encourage the voluntary participation of future trainees, leading to the ultimate aim of achieving students' favourable performance in mathematics. If this is the case, the SIPTT objectives to deliver effective training toward accomplishing the National Strategy for Education 2040 in Oman is met.

2.3   Training Evaluation

Training quality depends on training evaluation, transforming its failures into successes (Brinkerhoff, 1987). However, despite the importance, a significant number of organisations do not carry out the evaluation (Beardwell & Thompson, 2017). Effective evaluations are one of the most influential techniques for improving the learning process (McQueen et al., 2016). Stufflebeam and Coryn (2014) defined evaluation as "the process of delineating, obtaining, reporting, and applying descriptive and judgmental information about an object's value, as defined by such criteria as quality" (p. 312). Hence, training evaluation is an impartial and systematic gathering of data for policymakers and other interested stakeholders (Holton & Naquin, 2005). These decisions are related to presenting a justification for continuing, leaving, or adjusting based on the information provided from the evaluation.

The literature indicates various training evaluation motives, including (a) shaping dependability; (b) assessing the methods being used; (c) illustrating whether training has accomplished its organisational or/and individual goals; (d) legitimising the financial plan and existence of the training division by viewing how it contributes to organisational aims and

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strategies; (e) getting information on the most proficient method to create upcoming training programmes by measuring its weaknesses and strengths; (f) choosing whether to discontinue or continue training if the programmes are considered to no longer esteemed or/and out-dated; (g) choosing potential trainees; (h) approving cases, exercises, and tests to affirm that they can assess knowledge, skills, and abilities; (i) categorising which trainees have the most advantage from the training or otherwise where the information can be used to choose if a trainee must be retained, advanced, or transferred; and (j) recapping trainees on the knowledge, skills, abilities that is scholarly and how they need to apply it in the workplace (Arora & Talwar, 2019; Bramley, 1991; CIPD, 2015; El Hajjar & Alkhanaizi, 2018; Kirkpatrick & Kirkpatrick, 2006; Noe, 2017; Phillips 1997; Werner & De Simone 2009).

According to Scriven (1970, as cited in Stufflebeam & Coryn, 2014), there are two key roles of evaluation: (a) formative to help improve training programmes and other objects, and (b) summative to evaluate the significance of the object once it has been improved. Educators need to ensure they understand the distinction between formative, which is used to evaluate learning, and summative assessment, which is used to evaluate *the* learning (Parry-Smith et al., 2014). The importance of formative evaluation as a supplement to summative evaluation cannot be overstated (Sackett & Mullen, 1993).

2.3.1 Formative evaluation

Formative evaluation is an essential part of the improvement process. It delivers continuous feedback to help with the layout and then produce some object. The improvement of training addresses questions about the authenticity of content, the level of vocabulary, ease of use, the suitability of the media, material durability, efficiency, staff, and other things. In sum, a formative

evaluation is conducted to assist staff in developing what they are working on (Stufflebeam & Coryn, 2014).

Educators typically use formative evaluations during the design and development phases to develop instruction and learning materials. Another use of formative evaluations is to verify if the curriculum aligns with the learning goal and objectives (Parry-Smith et al., 2014). Formative evaluation provides information to both the learner and instructor so they can modify the teaching process to support further learning. The formative evaluation process is not conducted at the end of a course or class. It is ongoing and needs frequent testing, feedback, and increased learning opportunities (Niedwiecki, 2015). Formative evaluations are also conducted to provide instructors with data on how well participants are learning. If someone is having trouble during a class, an instructor can use this information to modify, accommodate, and promote learning and improve student success. To ensure a formative evaluation is practical, it needs to: (a) identify what constitutes excellent performance, (b) deliver high-quality information, (c) minimise the gap between existing and desired performance, (d) encourage a dialogue between the trainees and instructor, (e) facilitate the development of trainees self-assessments, (f) provide information to the instructor to help shape learning goals to provide trainees practice, feedback on their learning process, and to provide information about how well the trainees are doing, and (g) encourage positive motivational beliefs (Niedwiecki, 2015).

2.3.2 Summative evaluation

Summative evaluation monitors programme outcomes and impacts during or after completion of the course (Newcomer et al., 2015). It can support managers to determine whether the entire

content of the final training is refined. An external evaluator should typically carry out the summative evaluation to increase the objectivity of the training, and the results should be publicised. This type of assessment examines all traces of the body and studies them against the estimated needs of the person concerned. It compares the impact and costs of the object. In case the audience might be predisposed to judge the outcomes against the developer's aims only, the summative evaluation offers judgments about the extent to which the aims reliably reflect evaluated needs. Generally, summative evaluation assists stakeholders by providing them with independent assessments that compare competing programmes' budgets, qualities, and worth (Al-Hosni, 2014). Figure 2.1 shows the formative evaluation of input and process of the training while summative evaluation relates to the output of the training programme.
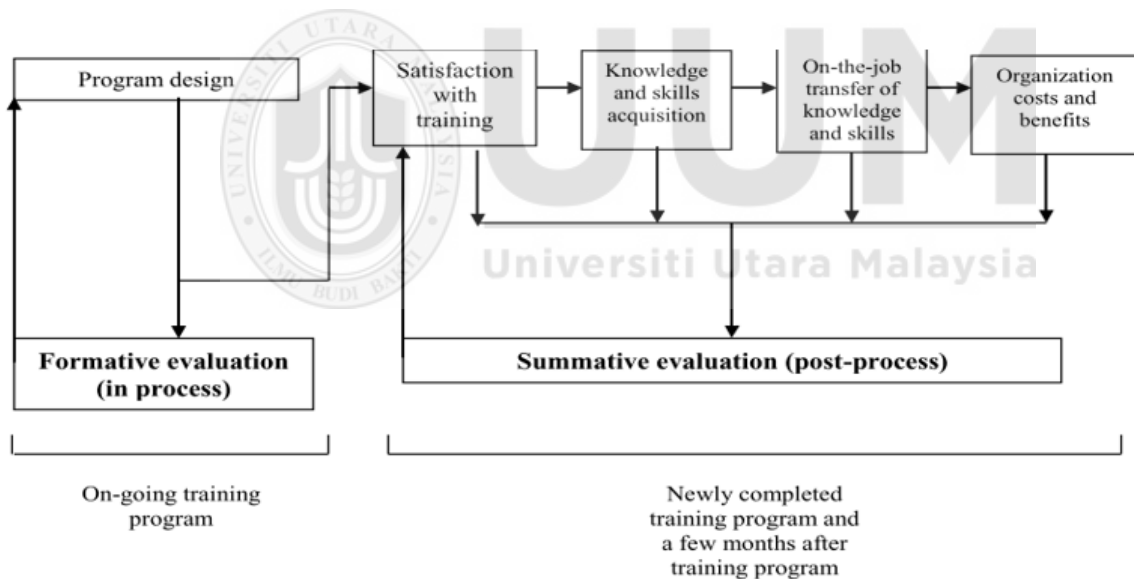
Figure 2.1
Formative and Summative Evaluation
Source: Al-Hosni (2014)

By using formative (during the course) or summative (after the course) approaches, questions about how the participants appreciated the training programme, how they learned vital information, and how to improve the programme for future sessions help evaluate the value of

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their training programmes, resources, and presenters for learning and success. If the training programme evaluation indicates that the programme has been well received and that critical information has been absorbed, successful training can be called effective training.

In summary, the primary purpose of formative assessment is to improve the quality of the programme being built so that the purposes for which it was planned can be accomplished (Beyer, 1995 cited in Hogan, 2007). On the other hand, a summative assessment is performed to provide recommendations to decision-makers or potential customers on the importance or quality of a training programme in relation to significant criteria (Brown & Gerhardt, 2002).

2.4 Evaluation models

An evaluation model is considered a training practitioners' road map. A practical evaluation model helps the user understand what a complicated process and present reality in a simple and understandable way is actually (Van Dyk, Nel, Loedolff, & Haasbroek, 1997, as cited in Dahiya & Jha, 2011). The literature appears to be dominated by two forms of training evaluation models. The first one is the goal approach, which is based on a micro-view of training activities. The second model is the system approach, which is a macro-based model. The micro-approach focuses on a specific training activity that analyses and describes the activities without directly considering the environmental aspects of the training activities. Meanwhile, the macro-model focuses on organisational internal and external factors that affect training activities (Al-Khayyat & Elgamal, 1997). The macro model allows both input and process variables to map the determinants of output variables. Each of the output indicators is associated with a unique set of inputs and process variables.

Many evaluation models have been developed with some variances due to the difference in evaluation philosophies (Worthen et al., 1987, as cited in Derya & Bulent, 2016). The present study highlights eight models relevant to the teacher training programme. The goal/micro approach includes (a) Kirkpatrick's four-level evaluation (1976) and (b) Phillips' (1997) five-level return on investment (ROI) framework. Whereas the system/macro approach includes (a) the contents/contexts, inputs, reactions, and outcomes (CIRO) model (1970), (b) Brinkerhoff's (1987) six-stage evaluation model, (c) Cervero's continuing education evaluation (1988), (d) Stufflebeam's improvement-oriented evaluation (CIPP) (2003), (e) Bushnell's (1990) input, process, and output (IPO) model, and (f) Easterby-Smith's (1994) CAIPO model. Because of the variety of models and determining which one is better suited to a particular situation is not easy. Evaluation is even further difficult by variations in perceived quality between evaluators and different stakeholders' interests (Nickols, 2005). Evaluating a training programme without considering which model to use for training quality can result in poor or misinterpreting outcomes (Eseryel, 2002). This section compares the most popular training evaluation models and discusses which model is best applicable to mathematics teacher training in SCPTT to understand the perceived quality.

2.4.1 Kirkpatrick's model

Kirkpatrick's four-level evaluation model was first developed in 1959. Kirkpatrick's evaluation model contains four phases of evaluation: (a) reaction level (whether trainees liked the training programme); (b) learning level (how much trainees learned during the training programme); (c), behavioural level, likewise referred to as transfer of training (whether trainees transferred what

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they learned in the training programme once back on the workplace); and (d) results level (the influence of the training programme on organisational aims) (Kirkpatrick & Kirkpatrick, 2006).

In 2009, the original Kirkpatrick's Four-Level Evaluation Model was updated and known as the New World Kirkpatrick's Model (Kirkpatrick, 2009). The update was primarily based on a need to resolve any perceived misconceptions of the proper use of the Kirkpatrick model and debates about any return on investment from training. To resolve the misconception, the New World Kirkpatrick's Model was established to define the four levels further to assist educators in understanding how to implement the levels. The New World Kirkpatrick's Model adds engagement and relevance to Level 1 (Reaction). Level 2 (Learning) initially involved knowledge, skills, and attitudes. It now contains the confidence and commitment of trainees. Level 3 (Behaviour) was initially defined as monitoring and reinforcing training on-the-job training, but it now contains encouragement and rewards. Level 3 is critical to achieving Level 4 (Results), and it consists now of leading indicators and desired outcomes (Kirkpatrick, 2015). Table 2.1 compares the original Kirkpatrick's model and New World Kirkpatrick's Model.

Table 2.1
Evolution of Kirkpatrick's Model

	Original Kirkpatrick Model	New World Kirkpatrick's Model
Level One	-Trainees' Reaction	- Trainees' Reaction - Engagement - Relevance
Level Two	- Learning; (Knowledge, skills, and attitude)	- Learning; (Knowledge, skills, and attitude) - Confidence - Commitment
Level Three	- Behaviour throughout the monitoring and reinforcing training on-the-job training	- Behaviour throughout monitoring and reinforcing training on-the-job training - Encouragement - Rewards
Level Four	-Results	- Results - Leading indicators - Desired outcomes

Source: Kirkpatrick (2015).

Of the four levels, Level 3 remains the hardest level for any training society or a particular organisation to achieve and take ownership (Kirkpatrick, 2009). Many organisations also feel Level 3 (Behaviour) and Level 4 (Results) would be difficult to achieve or too expensive to implement. These two levels could also be described as potential barriers to the execution of the post-training evaluation process (Kirkpatrick, 2009). However, due to the clarity and ease of use, many organisations rely on Kirkpatrick's model as a framework to evaluate their training programmes (Kraiger et al., 2015). Kirkpatrick's model focuses only on what happens after the training, not the entire training process (Reio et al., 2017).

2.4.2 Phillips's model

Fundamentally, Phillips' fifth level of evaluation (1997) prolongs Kirkpatrick's four levels of evaluation. This model compares the financial benefits of the programme with its expenses

(Phillips, 1997). It is not a duplication of Kirkpatrick's model as each is a different framework with its distinctive sights to consider each level of evaluation. Phillips' return on investment (ROI) model is summarised as follows: Level (1) satisfaction and/or reaction; Level (2) learning; Level (3) job implementation and/or application; Level (4) business results/impact; and Level (5) return on investment (ROI).

Phillips (1997) concluded that many organisations apply to level one evaluation that questions trainees' reactions at the end of their training programme. Data are gathered by distributing a questionnaire to the trainees. Apart from defining trainee reactions, information from responses is used in developing upcoming training programmes where the content of training, design, or delivery can be developed and revised. Level one is significant. However, similar to Kirkpatrick's opinions, a positive response does not confirm that trainees have acquired new knowledge or skills. To conclude whether trainees learned the planned knowledge and skills, an evaluation should then be pursued to define to what degree the trainees have understood what they have been acquired. That means the training evaluation has to be prolonged to the following level.

Level two emphasises learning (Phillips & Stone, 2002). The learning evaluation is concerned with assessing the degree to which the desired procedures, techniques, principles, knowledge, skills, or attitudes that are presented in training have been acquired by the trainees. Level three assessment is required to confirm that new skills and knowledge have been transferred to the workplace. Level three evaluates trainees' behavioural changes while in the workplace and their particular applications of the training material. Phillips and Stone (2002) asserted that the emphasis of the centre at this phase is the trainees, the job setting, and the support mechanism for implementing learning. Learning evaluated after the training has been applied in the job situation might show the regularity and efficiency of an on-the-job application.

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At level four, the evaluation emphasises the actual organisational outcomes accomplished due to implementing the skills and knowledge from the training (Phillips & Stone, 2002). The training is frequently started because one or more organisational goals are below expectation or there is a threat to an organisation's capability to execute and achieve its goals. This assessment defines the effect or influence of the training in developing organisational performance. It regularly gains objective information, such as output rises, costs and time savings or quality increases. It also gains subjective information, for instance, a rise in employee satisfaction, development, retention, etc. Generating organisational impact data contains gathering data before and after the training programme and connecting the training results to the suitable organisation assessments by investigating the resulting developments (or lack thereof) in organisational performance (Phillips & Stone, 2002).

While an organisation believes that it has had an impact on the business, the costs of training outcomes have to be considered. Up to level four, there is still no clue whether what is spent is valuable. Most organisations look at intangible results and rarely look into returns in financial terms, for instance, the return on investment (ROI). Phillips (1997) stated that an evaluation cycle is unfinished until level five takes place. One of the formulae for calculating the return on investment is the calculation of the net benefit percentage divided by the costs of the programme as follows:

$$ROI(\%)\ Net\ Program\ Benefits/Program\ cost * 100$$

Phillips (1997) summarised the process of developing ROI where post-training information is utilised. Through the information, other factors that may affect performance are identified but isolated. The aim is to define any amount of development directly linked to the training. To

calculate the return on investment, benefits determined in level four evaluation have to be converted into financial values and compared to training costs. Training costs contain the cost of developing and designing the training, charges by facilitators or instructors, materials for trainees, cost of facilities, administrative cost, the miscellaneous cost for trainees, and overhead cost. When analysing data, any matters that could not be converted into financial value are measured as intangible benefits that are similarly valued by organisations.

2.4.3   The CIRO model

The CIRO model developed by Warr et al. (1970) stands for Context/Content, Input, and Outcome/Output, which have to be assessed in training evaluation. According to Tzeng et al. (2007), this model is widely implemented in business research. In terms of the context evaluation process, operational, situation or performance information is gathered from the environment to determine the needs and types of training required. The training objectives must be consistent with organisational atmosphere and culture, emphasising the present operational context (Passmore & Velez, 2012). Meanwhile, input evaluation entails gathering and implementing information about alternative resources available for training interventions. At this phase, the trainer defines the training methodologies, styles, or strategies to be employed and alternatives, taking into consideration available training resources, timeliness, and financial and other resources available and accessible (Beech & Leather, 2006).

Response evaluation is synonymous with Kirkpatrick's response level; however, it gives more attention to recommendations. It encompasses the procedure of using the information gathered about the nature of trainees' experiences to enhance training based on individual

interviews or reports. Participants' opinions might uncover amazingly valuable information on the off chance that they gathered in a systematic manner (Lee & Pershing, 2000).

Finally, the outcome phase is parallel to the learning level in Kirkpatrick's evaluation model. It includes gaining and utilising the results or information generated by the training programme. This dimension is frequently the most significant part of the assessment, as it defines the degree to which training aims are accomplished. This dimension is measured at three levels of outcome evaluation, corresponding to three levels of training aims: rapid assessment (changes in participants' knowledge, skills, or attitudes, prior to return to the workplace), intermediate assessment (training impact on job performance and transfer of learning back to the workplace), and ultimate evaluation (training impact on the organisational performance) (Hogan, 2007).

2.4.4 The Brinkerhoff's model

In 1987, Brinkerhoff developed a six-stage training evaluation model by combining the robust result of the industry and business model with the formative and the improvement-oriented section of the social and educational event models. The six-stage model is detailed as follows: stage one evaluates the goals and needs; stage two evaluates the HRD design; stage three evaluates the operation; stage four evaluates learning; stage five evaluates the usage and endurance of learning, and stage six evaluates payoff.

The six-stage evaluation model is presented in a cyclic form (Brinkerhoff, 1987). It depicts the processes as continual. The organisation will have to determine whether to go back to earlier phases to solve particularly challenging parts. The different phases interrelate with each other. Sometimes the phases are nested in each other. Then, recycling begins, and the data gathered from earlier assessment efforts might be beneficial in developing upcoming programmes. Therefore,

each phase is not easily achieved once and abandoning it for the following phase is never reconsidered.

2.4.5 The Cervero's model

The Cervero's model (1988) proposes seven sets of evaluation questions structured around seven criteria to define whether the training was valuable. The seven criteria are (1) programme design and implementation; (2) trainee participation; (3) trainee reaction; (4) trainee knowledge, skills, and attitudes; (5) application of learning after the programme; (6) impact of the application of learning; and (7) programme characteristic associated with outcomes (Cervero, 1988, as cited in Singh, 2013). The design and implementation of a programme are concerned with what was intended, what was actually executed, and the degree to which the two are consistent. Commonly asked concerns are the actions of trainees and trainers and the appropriateness of the physical environment for promoting learning. Learner participation occurs anecdotally through unobtrusive observation of instructional events. Learner satisfaction measures participants' reactions and is based on various factors, including educational process, instructor performance, content, physical setting, and cost. The changes in the learner's cognitive, psychomotor, and effective objectives are the focus of the learner's attitudes, skills, and knowledge. The learning application is concerned with the degree to which acquired skills are transferred to the actual workplace environment. Programme characteristics are related to the programme outcome.

Cervero's ideas were influenced by Kirkpatrick (1959). Additionally, this model emphasises the implementation questions to determine what happened before and during the programme, unlike Kirkpatricks' model that focuses on the result based on the evaluation of post-training. It is considered a thorough model since it encompasses all stages of the process, beginning with the

program design phase and ending with the outcomes phase. Yet, the evaluation of administrative procedures is not clear in this model. However, due to this model evaluation's complexity, it may be deemed too time-consuming to implement. The author is too concerned with obtaining data about the entire procedure to consider its efficiency (Chong, 2005). As a result, the approach is more summative than formative (Al-Hosni, 2014).

2.4.6   The Stufflebeam's model

Stufflebeam's (1987) CIPP evaluation model considers the context, input, process, and product. The CIPP evaluation model incorporates a significant number of aspects of the CIRO framework (Passmore & Velez, 2012) yet offers a framework around the programme aims, the training substance and assistance, programme usage, and programme results. The CIPP framework was first structured for educational applications for the use of service providers, such as school administrators and universities managers. This model emphasises the environmental context in which the transition is to take place and illustrates the structured delivery of programme information to management (Stufflebeam, 2015). The CIPP model is a broadly well-known theoretical framework and has been used regularly for various purposes, such as to assess programmes in instruction and managerial organisations (Razack et al., 2007). However, Bennett (1997) stated that this model is excessively simplistic and difficult to execute in practice, which may account for its lack of wider attention and implementation by organisational professionals.

2.4.7   The Bushnell's model

Bushnell (1990) labelled the IPO (Inputs, Process and Outputs/Outcomes) model that perceives the evaluation process as a pattern. As generally perceived in the HRD evaluation field, this model

is utilised mostly in instruction, professional, and training areas (Kraiger et al., 2015). Bushnell (1990) stated that "the success of IBM's proposed global education network largely depends on the built-in mechanisms for tracking trainee progress, module completions, and mastery of various learning assignments" (p. 43).

The IPO model categorises the training process into three key phases that permit the development of the assessment plan, the training implementation and, lastly, the modification of the training based on the evaluation results. First, the input phase investigates performance indicator factors that may affect the training effectiveness (i.e., trainees' qualifications, trainers' qualifications and capabilities, materials quality, and facilities). Second, the process phase analyses issues, such as planning, design, developing, or conveying the training programme. In the third phase, the result evaluation is ordered into the output evaluation (short-term results, that is, data rising from the training interferences) and outcomes evaluation (long-term results linked to the training process sustainability after some time, along with progress in terms of organisational competitiveness or profitability). However, ascertaining the relationship between the results of training and organisation is very complicated because many different and varying factors influence the outcome (Ford & Sinha, 2008).

Bushnell (1990) claimed that these phases would assists the instructional designer formulate the evaluation's objective, make proper measurement instruments, identify proficient, compelling information sources, and link the evaluation results back to the original purpose. He also asserted that the IPO model could boost training responsiveness and adaptability and at the same time minimise training costs because an organisation can choose the evaluation bundle based on its financial plan, goals, and needs. For example, organisations may choose to assess the input phase just or up to the output phase as it were. Therefore, an organisation may diminish costs and improve

training. Although the IPO model largely combines the context and the administrative aspects, no clear indicators have been identified. Those factors are discussed in the Easterby-Smith's model (1994).

2.4.8 The Easterby-Smith's model

In 1994, Easterby-Smith developed an alternative framework combining the following components: Context, Administration, Inputs, Process and Outcomes. Those components reflect the acronym CAIPO, which Santos and Stuart (2003) clearly described in the following terms: Context evaluation emphases on the training system package, i.e., workplace that supports trainees, operational, situation or performance information gathered from the environment to determine the needs and types of the training required, and the training objectives that must be in tandem with organisational atmosphere and culture, emphasising the present operational context (Passmore & Velez, 2012). Administration evaluation's key objective is pre- and post-training activities, such as nomination, selection, training briefing, follow-up action and post-course evaluation. Inputs evaluation critically investigates methodology and subject matter. Evaluation concerned with process concerns with the experience of the trainees and the actual procedure applied throughout a training programme and experience of the trainees. Outcome evaluation investigates the change in attitudes, behaviour, skills, and knowledge of the trainee and overall performance of the organisation.

When Easterby-Smith (1994) developed his framework of CAIPO, he recognised obvious similarities with the CIRO model (1970). He, too, sought to contextualise the evaluation's subject by examining the environment of organisational in which the individuals work and, alike, denies causal relationships between levels (Santos & Stuart, 2003). By means of these actions, his study

establishes a framework with additional independent factors, allowing for a more thorough examination of external aspects that were previously overlooked in Kirkpatrick models. Finally, he noted that evaluation might serve two unique purposes: providing feedback or contributing to an existing body of knowledge. Both of these requirements are likely to be met by an external practitioner. For instance, knowledge assists in actual mathematics teachers training quality, while feedback contributes to its improvement. Also, the difference in the school location of the mathematics teacher trainees across the country may result in different quality levels of the training components (e.g., online and workplace task applications).

2.5   Comparison of Evaluation Models

Table 2.2 compares the evaluation models discussed earlier. The discussion of various evaluation models helps us better understand a shift in the topic of evaluating training: a course, programme, individual or organisation. Nonetheless, each model takes a dissimilar stance on the main elements to concentrate on a misalignment between the evaluator's choice of framework and quality proposition can lead to unclear outcomes. For instance, Kirkpatrick and Kirkpatrick (2006) examined the individual impact on organisational performance; Phillips (1997) focused mainly on return on investment, and Warr et al. (1970) emphasised evaluation as a policy instrument for policymaking. In Warr et al.'s model, the accountability for decisions is spread across most practitioners working within the same paradigm (Thackeray, 2017).

The framework of Kirkpatrick and Philips can be critiqued in two main ways: firstly, the implications of causal relations between the levels, secondly, the absence of contextual meaning. The first significant critique of the Kirkpatrick model, and therefore those who use it as a ground for the evaluation of training effectiveness, seems to be the presumption of causal and impact

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relations between various training levels (Bates, 2004; Giangreco et al., 2010). Warr et al. (1970) developed the CIRO model (Context, Input, Response, Outcome) partly in response to the second criticism of lack of situational consideration. They believed that a pre-and-post comparison should be carried out to assess training to show some improvement accurately. Their model counts the environment in which training and development may take place and enhances the Kirkpatrick model by including two preceding levels: (a) 'context', which is the evaluation of needs; and (b) 'input', which is possible resource problems (Mavin et al., 2010). However, despite taking context into account, the CIRO model is mostly focused on improving performance and does not assess behavioural change (Tennant et al., 2002).

By contrast, Easterby-Smith (1994) argued against such causal assumptions. Based on an extensive review of the literature and research, Easterby-Smith put forward the CAIPO framework as an alternative. Methods used in applying the CAIPO framework may be similar to those used in other system approaches. However, this model offers a set of training evaluation choices as the areas considered are more independent and are not related by the relationship between cause and effect (Santos & Stuart, 2003).

Despite a continuous flow of new models, many steps are behind the reliable evaluation of training interventions (Kraiger et al., 2015). Although some individual studies have been undertaken utilising the models, they are rather uncommon and usually overlook the model utilised (Kraiger et al., 2015). A public training evaluation survey demonstrates that estimating training quality is a challenging and complicated task (Wang et al., 2018). Similarly, CIPD (2015) stated that half of public organisations only assess training quality through participants' satisfaction and many encounter barriers to evaluations. In this regard, Nemec (2018) affirmed that evaluating training should go beyond simple satisfaction level ratings.

Table 2.2
Comparison of Evaluation Models

Model	Criteria	Strengths	Weaknesses
Kirkpatrick's model (1976)	1- Reaction 2- Learning 3- Behaviour 4- Result	The most popular and widely known approach due to its simplicity and ease of use (Kraiger et al., 2015).	First, it proposes to lead to an excessively simplified vision regarding the training effectiveness, mainly because it disregards the effects of the organisational context (Guerci et al., 2010). Second, it neglects the evaluation needs of all the other stakeholders involved in the training process (Guerci et al., 2010). Third, there is a doubt about causal relations between the levels of evaluation.
Phillips's five-level ROI model (1997)	1- Reaction and/or satisfaction and planned action 2- Learning 3- Job application and/or implementation 4- Business results/impact 5- Return on investment (ROI)	It measures success in areas of human resources function, taking into account the processes of the cost-benefit analysis and the ROI ratio calculation (Chmielewski & Phillips, 2002).	Complexity in determining returns on soft aspects of business such as training (Kraiger et al., 2015).
CIRO model (Warr et al., 1970)	1- Contents/Contexts 2- Inputs 3- Reactions 4- Outcomes	It gives effectiveness consideration of objectives (contexts) and training equipment (inputs), which make it more formative in nature (Tzeng et al., 2007).	This model does not measure behavioural changes, nor does it indicate how measurement takes place. Also, it does not assess the value of the HRD contribution to the organisational strategy. As a result, this model does not offer significant data related to the present training situation, which might lead to change (Tzeng et al., 2007).

Model	Criteria	Strengths	Weaknesses
Brinkerhoff's six-stage evaluation model (1987)	1- Evaluate needs and goals 2- Evaluate HRD design 3- Evaluate operation 4- Evaluate learning 5- Evaluate usage and endurance of learning 6- Evaluate payoff	Linear and follows a logical development and decision-making sequence. It uses both quantitative to determine or validate performance and qualitative data collection methods to gather best practices or the successful use of the training programme (Al-Hosni, 2014).	This model relies upon such a small sample that unidentified systematic problems with the training may be lurking under the covers of a case study. Additionally, it consists of both formative and summative evaluation, that is only feasible in perfect cases where the employer and the training organisers are accurately allied, where an evaluation design has already been developed during the training process, or where there are no competing deadlines or minimising budgets (Holton & Naquin, 2005).
Cervero's continuing education evaluation (1988)	1- Programme design and implementation 2- Learner participation 3- Learner satisfaction 4- Learner knowledge skills and attitude 5- Application of learning after the programme 6- Impact of application of learning 7- Programme characteristic associated with outcomes.	Theoretically, it is a comprehensive model that covers all the stages involved in starting from the programme design stage to the outcome stage (Al-Hosni, 2014).	The model may be viewed as being too tedious to implement due to its complexity. Also, this model is more summative than formative in nature (Al-Hosni, 2014).

Model	Criteria	Strengths	Weaknesses
Stufflebeam's improvement-oriented evaluation (CIPP) model (1987)	1- Context (C) 2- Input (I) 3- Process (P) 4- Product (P)	It provides an analytic and rational basis for programme decision making, based on a cycle of planning, structuring, implementing, and reviewing decisions.	Bennett (1997) stated that the model assumes rationality by decision making and disregards the multiple interpretations of these agents and diversity of interests. Bennett (1997) also indicated that this model is excessively abstract and difficult to execute in practical terms, which could illustrate its rare application among organisational professionals.
IPO training evaluation model (Bushnell, 1990)	1- Input 2- Process 3- Output 4- Outcome	This model includes feedback loops built in crucial junctions in the evaluation process, which make the training systems self-correcting. Similarly, this model offers a system outlook of the training being implemented and enhances the diagnosis of problematic areas by dividing the model into different stages and avoiding the diagnosis of problems with a single large process (Casey, 2006).	Lack of information related to programme functioning, or to the particular elements that influence the results (Robertson, 2004).
Easterby-Smith (1994)	1-Context 2-Administration 3-Input 4-Process 5-Outcome	Not sequential: the areas considered are independent and are not linked by cause-effect relationship (Nerza Rev, 2004). Provides greater flexibility in giving options to subjects and methods of implementation (Sahoo & Mishra, 2017).	Lack of attention about return-on-investment issues.

2.6 Evaluating Training Quality the SIPPT

Training evaluation is used to find out about training quality. A systematic approach to evaluation is central to achieving consistent success in training programmes (Punia & Kant, 2013). When training is not assessed, the quality of training programmes may be affected. Therefore, evaluation plays a critical role in defining the quality and influence of the training programmes (Smidt et al., 2009). So, the present study investigates the trainees' perceptions about the quality of the mathematics teacher training programme in the SIPTT to find out the reasons why trainees did not perform well in cohorts one and two, why a significant withdrawal occurred, and why a severe decline in participation in cohort two. Based on the findings, the researcher can suggest recommendations for training improvement in the SIPTT and policymakers.

After reviewing the evaluation models, the most suited to this study is the CAIPO model to investigate the indicators that may affect mathematics teachers training quality components (face-to-face, online, and workplace tasks applications). This model is chosen for two key reasons. Firstly, this model is compatible with most factors mentioned in Section 2.6 that may influence SIPTT training quality. Secondly, the training evaluation practices in the MOE in Oman also adopt a framework based on the system approach as depicted in Figure 2.1. So, investigating training quality in SIPTT, which is a part of MOE, through these processes will be more consistent and accurate.
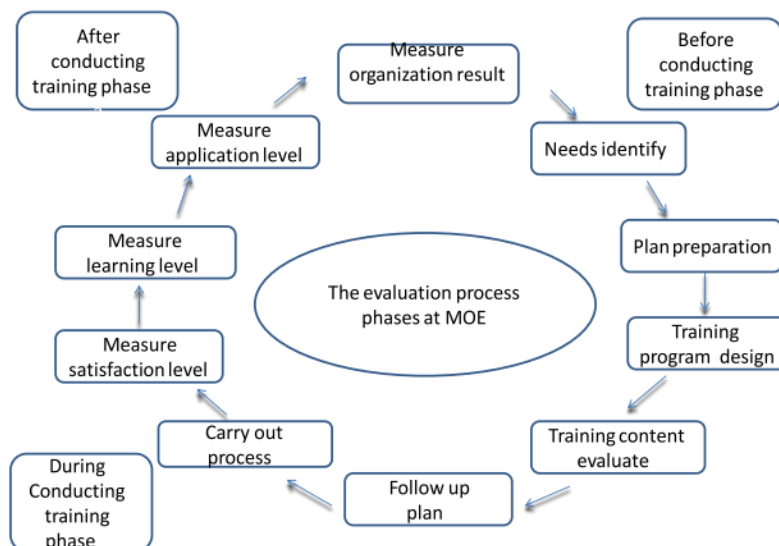
Figure 2.2
Existing Training Evaluation Framework in the MOE in Oman
Source: Al-Hosni (2014)

Thirdly, past studies structured their frameworks based on a system approach (Al-Khayyat & Elgamal, 1997; Koch, Muehlemann, & Pfeifer, 2019; Chang & Chien, 2012; Deus, 2014; Lipowsky & Rzejak, 2015; Park et al., 2017; Mizikaci, 2006; Peters & Giacumo, 2019; Tantri, 2014). This more adaptable approach enables the inclusion of results and recommendations that may have a substantial effect on the program even if not directly tied to programme objectives. The CAIPO training evaluation model is a systematic approach, which is applicable to investigate the quality of mathematics teachers training in SIPTT in Oman.

2.7   Factors Influencing Training Quality

This section reviews and synthesises the factors considered to influence training quality. In particular, the present study discusses the factors based on the CAIPO model, which the present study serves as a theoretical foundation. Specifically, in terms of Context, the present study assesses the work environment. At the same time, Administration is about the procedures and policies, Input (training content, facilities,

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trainer competencies, and trainee characteristics), Process (delivery and trainer follow-up and feedback), and Outcomes (perceived benefits).

2.7.1 Context

Training is a crucial accountability of all management levels in an organisation. A joint effort from management and employees is necessary for effective training to take place. The work environment contains such factors as peer encouragement, managerial support, opportunities to apply learned skills, adequate resources, technical support, and consequences for using training on-the-job (Burke & Hutchins, 2008; Kontoghiorghes, 2001; Lim & Morris, 2006; Sanjeevkumar & Yanan, 2011). Managers can encourage learning in various ways, including simply allowing staff to engage in a training programme (Birdi et al., 1997). Equally, supervisor encouragement and peer inspiration could raise the acquisition of necessary abilities and skills among trainees (Tai, 2006).

The work environment has been found to significantly impact training planning and subsequent transition of learning to the workplace (Al-Eisa et al., 2009; Tracey et al., 1995; Yaqoot et al., 2017a). Ellström (2012) examined how learning efficacy is affected by the working environment. He noticed that an organisation's lack of managerial or other internal requirements could slow down the effect of training. If an organisation faces adverse environmental conditions, both internally and externally, a negative influence on the quality of training could result. Birdi (2005) claimed that poor management support or an unfavourable departmental environment could limit the impact of creativity training on the implementation of ideas. Training is negatively affected if there is less departmental aid or adverse training environment (Chiaburu, & Tekleab, 2005; Haslinda & Mahyuddin, 2009;

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Omar et al., 2009; Podsakoff & MacKenzie, 1997; Punia & Saharan, 2012). Therefore, to make the most of the training investment, a positive atmosphere must be created to enhance engagement motivation and apply the knowledge and skills learned in work (Salas & Stagl, 2009). Otherwise, failure to recognise such environmental factors can have a major impact on policymaking and increase the possibility of either pursuing fruitless programmes or cancelling useful programmes (Bates, 2004).

Numerous studies have shown a clear link between the work environment and practices on the one hand and the quality of training on the other (Rajasekar & Khan, 2013). Hence, it is necessary to study the surrounding environment affecting the quality of the mathematics teacher training programme due to the different trainees' workplace locations and components of training in particular (online and workplace task applications).

2.7.2 Administration

Planning is the key to proper training programmes being designed and implemented. Training plans must meet the needs and expectations of the participants (Chval et al., 2008). Training plans help to find practical solutions to any associated contingencies that may happen during the training process (Silverman, 2019). The training period required depends on the training goals and the complexity of the training programme. It should include the number of days to prepare, the number of hours each day, and the time to train (Al-Alawi, 2003). A timetable of training plans can influence the quality of training (El Hajjar & Alkhanaizi, 2018). Research on quality training has most frequently concluded that learning success depends on the length of the programme (Salas et al., 2000) and ease of administrative procedures (Driskell, 2011).

Furthermore, voluntary versus compulsory participation in a training programme may be perceived as a situational constraint. Voluntary training usually leads to a higher motivation for learning (Kodwani & Prashar, 2021). However, compulsory training can influence the quality of training in a different way depending on whether the training is perceived as manipulative or as a sincere effort on the part of the organisation to move the organisation forward as a whole (Freeman, 2009). According to a study by Huang et al., (2014), conflicting company policies may have influenced participation in the safety training programme, as intended.

Furthermore, Au et al. (2008) stated that training policies that focus on particular training methods are often ineffective compared to policies that focus on the goals and expected effects and outcomes. This strategy is often difficult for Oman's public sector organisations (Rajasekar & Khan, 2013). In the non-mandatory mathematics programme in SIPTT, the number of trainees decreased significantly in the second batch. This study explores whether the procedures are the reason, besides, the quality of the procedures in the three training components.

To sum up, training quality may be affected by some barriers. Previous studies have shown that obstacles related primarily to resource limitations, such as lack of time, conflict with schedules and activities, self-regulatory learning processes (Hicks et al., 2007; Klein et al., 2006). These difficulties can interfere with the choice of persisting in training or evading the course altogether (Abbad et al., 2010, as cited in Martins et al., 2019).

2.7.3   Inputs

Training inputs refer to the potential contribution of training content, facilities, trainer competencies, and trainee characteristics to the overall quality of a training programme (Xiao, 2007).

2.7.3.1 Training content

Without readiness and identification of training needs of the workforce, organisations could not increase their performance as expected (Tunio et al., 2016). A critical step in developing and implementing a job-relevant training programme that meets trainees' needs is to identify what needs to be learned (Bellet al., 2017). Training is needed if the employees do not measure up to the anticipated performance level, as noted by management. Based on this information, suitable choices can be made on the programme's goals and the content to be covered in training (Goldstein & Ford, 2002).

It is essential to discern the training requirements of individuals and groups and how their needs suit the general organisational goals (Beardwell & Thompson, 2017). Understanding the training goals, their significance to personal and organisational needs, and implementation expectations can significantly enhance the motivation of learners (Montesino, 2002). The training goals determine the most suitable criteria for evaluating the quality of training (Arthur et al., 2003). Enhancing training quality can be assisted directly by employee awareness of training goals (AlYahya & Norsiah, 2013).

Researchers have long recognised the need to comprehend and evaluate the learning of facts, values, and methods specified as training goals (Ford & Sinha, 2008). Appropriate learning goals are evident, measurable, and concise. To the extent that these three criteria are fulfilled, the instruction content will be more targeted and

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eventually more helpful (Salas & Stagl, 2009). Designing a training solution contains a sequence of operations to promote the development of training content, comprising: (a) designing a learning architecture; (b) creating educational experiences; and (c) developing evaluation instruments. Results from a study of 400 human resource managers across 40 nations indicate that blended learning solutions are regarded as the most effective approach to meeting training needs (IBM, 2008 as cited in Salas & Stagl, 2009). For this reason, the mathematics training programme by SIPTT is delivered in three different methods (face-to-face, online training, and workplace tasks applications) so that the trainees get the maximum benefit.

The content of the training program implies that it must be comprehensible and relevant to the learners and equipment in line with the suggested course, learning goals, and results (El Hajjar & Alkhanaizi, 2018). The content involves indicators capturing the sort of knowledge or abilities that a specified programme seeks to develop among recipient teachers, such as whether the programme focuses on (and if so, which) pedagogy, topic content, new technology, counselling, classroom management, evaluation, or any mixture thereof (Arancibia et al., 2016). Studies have found that training objectives and content are significantly and positively related to trainees' behaviour (Al-mughairi, 2018; Driskell, 2011), even though some research studies did not find training content to affect training quality (Lin, 2012), suggesting that the perceived training content quality varies from person to person according to his/her knowledge and experience (Lipowsky & Rzejak, 2015).

Training materials used by trainers are another factor found to influence the quality of training (El Hajjar & Alkhanaizi, 2018; Lin, 2012; Yaqoot et al., 2017b). The main goal of using training materials is to involve the trainees during the activity, promote active interaction between them, foster faster learning, and help improve their

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understanding. Usually, these training materials consist of video clips, audio, and hands-on instruments to improve trainees' learning experiences. Trainees may be prepared to maximise their abilities, understanding, and attitude towards the training programme by choosing the most appropriate media and materials (Jones, 2005). Since there is overwhelming evidence that training content affects training quality, this study considers how trainees perceive the training content to indicate the training quality of the mathematics teacher training programme.

2.7.3.2 Training facilities

Facilities are one of the critical factors responsible for executing the training programme successfully. An unsatisfactorily designed training environment has a detrimental effect on participants' intake (Lendahls & Oscarsson, 2017). Conversely, good training facilities have been shown to have a positive influence on the quality of training and the learning outcomes (Al-mughairi, 2018; Chukwu, 2016; El Hajjar & Alkhanaizi, 2018; Ogunu, 2000; Sanjeevkumar & Yanan, 2011; Yaqoot et al., 2017b). Training facilities must have high-quality indoor environments that can positively influence the efficiency of the task and the attention span of trainees (El Hajjar & Alkhanaizi, 2018).

Proper training facilities must have a training atmosphere that is flexible and technologically advanced (El Hajjar & Alkhanaizi, 2018). Facilities include training equipment, site design, sound lighting, hardware environment, soft environment participation of trainees, and classroom climate. They also may consist auditoriums that are typically large rooms, medium-sized training rooms for various purposes, computer training rooms, audio / visual rooms and laboratories, and other training

resources (Sanjeevkumar & Yanan, 2011). To enhance learning, training rooms must be sufficiently bright to prevent the trainees from falling asleep (Rodrigues, 2005; Wong, 2004) and have well-arranged furniture such as shelves, tables, and chairs (Harvey et al., 2001). Despite the purported importance of training facilities, some studies did not find a significant influence of the training environment on training quality. Owens and Price (2009) reviewed two higher education institutes in the United Kingdom (UK) and found that new technologies did not necessarily make their institution more friendly. Besides, new technology may not substantially boost learning activities (Barcala et al., 2000; El Hajjar & Alkhanaizi, 2018; Kassim & Ahmed Abdulla, 2006; Lin, 2012) because the trainer should use the technology correctly during training and use it to fit the different learning styles of the trainees.

As indicated earlier, the mathematics teachers training programme in SIPTT consists of three different training methods (face-to-face, online, and tasks application), and each of these components differs in their use of technology. Thus, investigating mathematics trainees' perception qualitatively enhances the understanding of the role of technology and other facilities in training quality.

2.7.3.3 Trainer competencies

An instructor is one of the key training components. Knowledge of a particular subject is the most essential characteristic of an instructor. Nevertheless, knowledge in the field is insufficient and should be supplemented by the ability to transfer it to the participants articulately and clearly (Ghosh et al., 2012). The skills and expertise of trainers ranked high among factors that helped successful and profitable training and primary contributors to the quality of training (Kester & Oludeyi, 2017; Ghosh et al.,

2012). Yaqoot et al. (2017b) and Lin (2012) found that the abilities of trainers at different Kirkpatrick levels had a positive relationship with training effectiveness. Al-Mughairi (2018) revealed that the quality of trainers' performance was linked only positively and substantially to the two outcomes of training: reaction and learning.

According to Dayal (2001), the primary concern is that the instructor must be transparent about two aspects (i) the training goals are precise, i.e., the expected outcome, and (ii) the training material and technique are capable of attaining the specified outcomes. Furthermore, trainers may be able to identify the training features by maximising the output of the trainees' learning skills and abilities (El Hajjar & Alkhanaizi, 2018). In addition to the technical knowledge, the interpersonal skills of the trainers are one of the variables that ensure effective training because such skills could improve the dedication of trainees to the programme and the working relationships between the trainer and trainees (Ghosh et al., 2012). According to Chukwu (2016), trainees affirmed that trainer attributes were one of the reasons the training programme was successful.

Past literature showed that instructors influenced training outcomes through their skills (i.e., content knowledge; Harris et al., 2014; Rasli et al., 2012) and their expressiveness (Towler & Dipboye, 2001). Nevertheless, Al-Mughairi (2018) found that trainer behaviour and performance had a minor influence on learning transfer intention. This study investigates the trainees' perceptions of the trainer's role on the quality of mathematics teachers training, as his/her role differs in these three components.

2.7.3.4 Trainee characteristics

Trainee characteristics can be broadly defined to comprise capabilities (e.g., intelligence and general mental ability, and specific skills), motivational constructs (e.g., self-efficacy, goal-orientation), personality traits (e.g., Big Five, locus of control), interests and values (e.g., occupational and vocational interests), emotions and attitudes (e.g., learning motivation), and perceptions (e.g., climate for training and perceived managerial support) (Bell et al., 2017). Empirical evidence suggests that trainee characteristics (Newcomer et al., 2015; Tai, 2006), such as being ready for training (Mavin et al., 2010; Williams, 2008), being open-mindedness (Fischer, 2011), having perceived control (Saks & Haccoun, 2007), and having the ability (Driskell, 2011) and motivation (Omar et al., 2009; Tai, 2006; Yanson & Johnson, 2016; Yaqoot et al., 2017a) affect training quality. Other research found that employees' education and experience determined training programme quality (Ramachandran, 2010). Trainees with a high education level tend to be more enthused learners and achieve more (Chiaburu & Marinova, 2005).

Trainee motivation and self-efficacy are a good measure of training quality in the public sector (Yanson & Johnson, 2016). Trainees are motivated to join a training programme voluntarily instead of being assigned by the management (Tsai & Tai, 2003). Participants are more likely to oppose training opportunities if they do not see any potential advantages associated with the activity. Despite the significant influence of these trainee characteristics in training quality, others did not find a significant effect of educational qualification, work experience, or sex on the quality of the training (David, 1997, as cited in Lin, 2012). The literature indicates a lack of interest by the learner in the content of the course, and misunderstandings of its existence and

scope are some of the personal factors that hinder perceived training quality (Hicks et al., 2007; Klein et al., 2006).

Regardless of the empirical evidence of the importance of trainee characteristics, they are often overlooked when selecting trainees (AlMadhoun, 2006; Beardwell & Thompson, 2017; Peterson, 2002; Rodrigues, 2005). Training is most valuable for people who have the required intellectual capability because they are likely to feel that the training is beneficial to help them perform better and benefit their career (Blanchard & Thacker, 2013). The majority of existing studies are quantitative in methodology, which illustrates the need for qualitative research in this area. Nevertheless, they caution against claiming causality, as it is challenging to prove direct links to training quality. However, it is unknown how trainee attitudes and attributes influence training quality in non-mandatory training programmes (for instance, mathematics teachers), which may present a variety of distinct issues, ranging from recruiting through training.

2.7.4   Process

Process evaluation monitors the training implementation stages. It serves as a continuous check on the implementation of the training. Process evaluation is critical objectives include documenting the process and providing feedback on (a) the extent to which planned activities are carried out and (b) if plan revisions are necessary. A secondary objective of process evaluation is to ascertain how participants accept and fulfil their duties (Xiao, 2007). While the results showed the necessity of increasing attention to the process of determining the training needs of the human resource management (Al-Quraishi & Gabraw, 2021).

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Process evaluation can be precious for service-learning training because it fosters the development of relationships between the evaluators (in this case, the SIPTT evaluation department) and the trainees based on a growing collaborative understanding and professional skill competencies, which can promote the program's long-term sustainability (Zhang et al., 2011). In the present study, the process entails two facets: delivery and follow-up/feedback, as discussed below.

2.7.4.1 Delivery

Implementation is a crucial step in the training process. It includes three major tasks, including (a) setting the learning stage, (b) offering a blended learning approach, and (c) easing transition and maintenance (Salas & Stagl, 2009), which corresponds to the structure of SIPTT mathematics components (face-to-face, online training, and workplace tasks application). Information is presented via the use of lectures, case studies, reading assignments, and open discussions. Careful use of training methods can be a very cost-effective investment in the sense that a person or group requires the appropriate method.

An instructor should be well prepared for the session by initiating the learning process criteria, such as presenting appropriate training content, providing a harmonious atmosphere, and using the right presentation skills (Lin, 2012). The trainer's primary goal is to inspire learners and improve their willingness to learn new skills and ideas (El Hajjar & Alkhanaizi, 2018). The presentation style helps participants learn and remember at this stage, which could be reached if trainers use dynamic and informative presentation styles. Besides, participants can understand the content much better by using simple language (Jones, 2005; Johnson et al., 2009).

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Robotham (1995) found that to achieve optimal learning results, instructors must have awareness and understanding of the style of the learners. Widyaiswara et al. (2019) found that constructive learning affected training quality.

Furthermore, Rangel et al. (2015) found that the chosen learning style of trainees had a significant effect on the relationship between expressiveness and outcomes of trainees. Trainees who favoured an experiential approach reported higher transfer intentions when the information was expressively and experientially presented. Sitzmann et al. (2008) also showed that the best predictors of trainee reactions were teaching style and human interaction (interaction with the instructor and other trainees). Likewise, Chou (2001, as cited in Sanjeevkumar & Yanan, 2011) found that learning style can interfere with and influence the quality of training methods. These considerations are significant because the transition is positively linked to educational factors, such as learner-centred environments (Gegenfurtner, 2011).

Adults bring previous knowledge and experience to professional learning, so it should combine past experiences with new learning, provide opportunities for them to share their experiences, and be reflective. Adult learners' diverse learning styles must be considered when developing professional training methods that involve case studies, simulations, problem-solving, and discussions. Furthermore, their various learning styles must be taken into account because adult learners prefer problem-solving strategies and cooperation (Fogarty & Pete, 2007). Therefore, it is vital to analyse the training's design features to clarify why specific training outcome effects are created. Past studies also found that training delivery style influences training quality (Arthur et al., 2003; El Hajjar & Alkhanaizi, 2018; Harris et al., 2014; Rangel et al., 2015; Towler et al., 2014).

Furthermore, McNamara (2019) pointed out that choosing appropriate training activities improve the learning process. Several commentators have noted that organisations often use ineffective training approaches, which can be expensive as well as time-consuming and produce very little change in trainees' performance (Beardwell & Thompson, 2017). Studies have also reported that the training method was not linked to learning strongly or substantially (Al-Mughairi, 2018). El Hajjar and Alkhanaizi (2018) showed that participants had neutral perceptions of the quality of delivery style about their training programme because it did not meet their needs and expectations.

Effective and acceptable training methods, such as face-to-face sessions, online training, self-directed and interaction, or multimedia-inspired lessons, are important in determining training quality because training methods are designed to consider an organisation's specific needs (Driskell, 2011; Tuzun, 2005). Arthur et al. (2003) revealed that the quality of the training appears to differ depending on the training delivery systems and the task or skill trained. Akhorshaideh (2013) concluded that a successful training system needs to use training approaches that can accommodate trainees' efforts.

Because there is no specific training method, researchers continue to explore how best to deliver relevant knowledge to trainees. Practitioners are specifically looking for cost-effective, content-valid, user-friendly, engaging and technology-based methods. In the SIPTT training programme, implementing training includes delivering the blended learning solution. There are three mechanisms for delivering content: face-to-face training, online training, and workplace task application.

In each module, three methods are used: (a) the face-to-face method is used to deliver one-third (i.e., 30%)of the module for a period of five days, (b) the online

method takes up 20% of the delivery. The online method also includes interactive training activities that are performed within two weeks, and (c) practical training tasks that must be applied by the trainee in his/her school under the guidance of the trainer. Once completed, the task must be submitted within six weeks. Such a method is used to deliver 50% of the module.

2.7.4.2 Trainer follow-up and feedback

When the content of the training is delivered, trainers and intellectual learning architecture, or a combination of the two, need to evaluate learners' progress and provide timely, actionable, and reliable feedback (Bell & Kozlowski, 2002). The system needs to allow trainees to produce reasons for their behaviour during practice (Salas & Stagl, 2009). Trainees may sometimes need advice on how to learn from their mistakes. It can assist teachers in becoming aware of their capability growth. To be effective, a feedback element should be provided systematically (Lipowsky & Rzejak, 2015). It is, therefore, necessary to encourage trainees to reflect on their training experiences and continuously update their learning to avoid deteriorating skills (Salas & Stagl, 2009). Indeed, some of the features of active training programmes encourage participants to engage in reflection, thinking, and analysis with a strong commitment to monitoring (Browne-Ferrigno, 2003; Peterson, 2002).

The three components of the mathematics teachers training programme at SIPTT, i.e., face-to-face training, online training, and workplace tasks application, require a trainer's feedback and follow-up within two years' duration of training. The feedback system is a trainee assessment tool to measure and calculate their level of behavioural change (in terms of new knowledge gained and new skills developed) as

a result of previous exposure to training programmes and activities (Mory, 2004). The feedback system is a training aid used to obtain information on the results of the training programme (Kester, 2016, as cited in Kester & Oludeyi, 2017). It is also considered to be the most critical component of learning and the most significant factor in the success of training (Christina & Alpenfels, 2002; Kester & Oludeyi, 2017; Phillips & Phillips, 2002; Rothwell, 1996). The quality of training research has most commonly concluded that training success depends on diagnostic feedback (Salas et al., 2000; Williams, 2008). The feedback system is frequently cited among the causal factors of failure in a training programme (Christina & Alpenfels, 2002).

Rama and Vaishnavi (2012) contended that an organisation needs to use ongoing assessments to determine learning outcomes and relate those outcomes to a succession plan to improve or optimise the quality of the training programme. Moreover, Huang et al., (2014) asserted the necessity of immediate feedback during the training. According to Widyaiswara et al. (2019), the feedback is about the instructor and trainee success and the reliability of the learning activities layout and execution. The emphasis on continuous use of feedback is a crucial feature of a systematic approach to learning assessment (Ford & Sinha, 2008). Some teachers indicated that they did not get sufficient support from their principals, superiors, and colleagues in the SIPTT training programme (Al-Jabri et al., 2018), which may influence training quality.

Moreover, for the views of the instructors, needs for improvement, eagerness to participate, supportive participation, learning-based components and mutual understanding have emerged as the categories (Ipek, 2022).

2.7.5   Outcomes

In outcome evaluations, evaluators assess the intended (training objectives) and unintended (intangible results), short term (passing the programme and trainee satisfaction) and long-term outcomes (improving teacher and student performance). They provide feedback during a programme implementation on how the programme goals are being addressed and achieved. Program evaluators use interim outcome evaluation feedback to maintain focus on achieving important outcomes and identify and address deficiencies in the programme's progress toward achieving important outcomes. Program overseers, funders, and constituents use the final outcome evaluation results to judge whether the programme's accomplishments were significant and worth the cost. The programme's potential adopters would use the outcome evaluation findings as to the most important information for deciding whether or not to adopt the programme (Stufflebeam & Coryn, 2014).

The quality of training is the value of services (i.e., training) to trainees. The perceived positive outcome as learning emphasises the degree to which they change their behaviours, develop their knowledge and/or enhance their skills by completing a training programme (Kirkpatrick & Kirkpatrick, 2006). Perceived benefits are a factor that substantially influences trainees' willingness to attend training and development activities (Noe & Wilk, 1993). Trainees displayed more positive emotional responses when they were more inspired to train effectively (Billington et al., 2009; Seikkula-Leino, Ruskovaara, Ikavalko, Mattila, & Rytkola, 2010; Tsai & Tai, 2003), leading to the enhancement of work performed after the training (Seikkula-Leino et al., 2010).

Training practitioners have usually analysed trainee perceptions of whether they liked the course and the trainer (Rafiq, 2015). The notion of trainee perception

about the quality of the training programme may include learning responses and expectations of usefulness (Alliger et al., 1997). The perceptions of the trainees regarding programme quality are related to the importance they find learning as providing them with the required skills and knowledge to perform well in their work and/or increase their overall effectiveness within the organisation. On the other hand, utility perceptions concentrate on how trainees see the training materials required to acquire skills and enhance job performance. Utility perceptions concern an individual's personal growth and development and the degree to which they view the learning as contributing to their long-term career prospects and opportunities within and outside the organisation (Giangreco et al., 2009).

Warr and Bunce (1995) addressed three forms of trainee perceptions: the course's pleasure, the course's importance to the work, and the course's complexity. Alliger et al., (1997) distinguished between learning responses and usefulness expectations. The reaction to training is related to the degree to which trainees consider learning as providing them with the required skills and knowledge to perform well in their work and/or increase their overall effectiveness within the organisation. Arthur et al. (2003) conducted a meta-analysis of training quality which reveals that the most critical indicators of training quality are learning outcomes.

Training goals need to be clearly defined before conducting a training programme. Therefore, changes in knowledge, abilities, or behaviours can be measured effectively against learning goals using performance tests (Tamkin et al., 2002). In mathematics teacher training in the SIPTT, this includes determining four primary learning objectives: (a) introducing and reviewing new learning and teaching strategies; (b) using software to teach and improve student thinking skills; (c) implementing problem-solving, out-loud thought strategies; and drawing up action

plans to address poor student performance; (d) developing teacher skills; The most important way of evaluating learning effectiveness in the workplace is evaluation and performance use (Tamkin et al., 2002). Nevertheless, evaluating outcome effectiveness typically poses some obstacles and time constraints to assess behavioural change. If the behaviour changes attributed to the attendance of the training do not translate to the workplace, then it is necessary to realise why such an adjustment did not appear in the actions of the trainees (Bates, 2004).

Regarding improving mathematics teaching, the TIMSS has shown the effects of usage times and handling of instructional methods and revealed a need to employ different methods (e.g., teaching through games, inquiry-based learning, and active learning), which differ in their level of effectiveness. In the case of learning level in mathematics teachers training at SIPTT, evaluations emphasise acquiring knowledge, skills, and attitude changes. It distinguishes cognitive (best questioning theories), skill-based (developing thinking skills), and affective outcomes (attitudes, motivation, and leadership). The behavioural level covers job-related behaviour and performance after training and indicates a transfer of training to the job. Subsequently, the mathematics student achievement in the TIMSS would be improved, as expected of the MOE.

Previous literature has investigated the factors that influence the knowledge and skills gained from training. Salas and Stagl (2009) found that engaging managers and supervisors in promoting, acknowledging, and rewarding the newly acquired knowledge, skills, and abilities could support trainee learning and application. Abdelhakim et al. (2018) interviewed 26 cabin crew in food safety training from 20 international airlines and found that inadequate training did not accomplish learning and behavioural change.

The perceived influence of training on non-monetary benefits was found to be highly associated to trainees' motivation and commitment to their own personal growth (Santos & Stuart, 2003). Hence, if the mathematics trainees in SIPTT perceive benefits of enrolling on the programme will affect their professional lives and that the knowledge, skills and abilities included in the programme deserve commitment in this non-mandatory programme, the number of trainees will increase, and the number of withdrawers will decrease, which will be an indication of the quality of the training programme.

2.8 Conceptual Research Framework

The previous studies on training quality shows that the different procedures for evaluating training quality are not simple rather appears confusing and complex (Santos & Stuart, 2003). There are numerous training evaluation models which often causes panic among practitioners (Sahoo & Mishra, 2017). One of the main issues with evaluating training quality is that various participants in an organisation are trying to evaluate diverse issues (Nickols, 2005). For instance, the management is enquiring about the return on investment, the instructor is considering confirmation, and the participants are evaluating the effectiveness of a programme. Each working in different environments, such stakeholders may use their standards to assess failure or success, using the resulting data in various ways (Dionne, 1996).

The systematic approach aims to plan and enhance a programme by recognising activities that are crucial to achieving the goal, repetitive, or have contradictory or implausible links to programme objectives. It connects the position of a programme in the organisation or hierarchy of problems, mainly if there are common logic charts

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at different levels of management to develop a shared understanding of the system and expectations of services, clients, and outcomes (Newcomer et al., 2015). A systematic evaluation analyses the quality of the whole system and enhances the interfaces between the subsystems to increase the effectiveness of the system (Rossi & Lipsey, 1999). Many researchers believe that one of the key obstacles to investigating quality for the training programme is the difficulty in knowing how and what to evaluate (Mann, 1996).

Although the CAIPO model states training monetary benefits as a part of the outcomes phase, this study does not consider it for two reasons. First, this study explores trainees' perspectives about voluntary mathematics teacher training quality provided by a public institution freely, and second, the research objective is to determine factors that influence mathematics teachers training quality on the SIPTT rather than measuring return on investment (ROI). Due to the complexity and often the unreliability of converting learning benefits into monetary value, estimating the ROI is the most challenging step in the evaluation (Olexová, 2018). The estimation of ROI allows evaluating the training in quantitative terms (Olexová, 2018), which is contradictory to this qualitative study. Besides, the outcome phase (long-term outcomes such as organisational performance improvement) in the CAIPO model is irrelevant to the research question. So, it is excluded from this study because the primary aim of this study is to investigate trainee perceptions about the quality of mathematics teachers training in the SIPTT while the outcome phase considers training impact on the organisation level. In addition to that, proving relations between the training programme and organisational impact is challenging (Robertson, 2015).

Nevertheless, the study offers management researchers a challenging area to explore and enhance the quality of training programmes. Hence, the study is guided

by the CAIPO evaluation model to investigate mathematics teachers training quality in the SIPTT using a range of qualitative indicators to determine the Context-Administration-Input-Process-Outcomes quality. A conceptual framework based on the model is shown in Figure 2.3 to guide the present research. Using a logic model (such as the CAIPO model) allows the programme designers and other participants to create shared understanding and expectations (Newcomer et al., 2015). This is in line with Dermol and Cater (2013), who believed that the training programme itself should be connected to the trainees rather than organisational effectiveness. They suggested that evaluating training quality itself relies directly on the trainees, which is contradictory to most training evaluation models. While multi-stakeholder evaluation provides a more comprehensive method to investigating a programme quality (Guerci & Vinante, 2011), the opposite – a subjective, biased, single perspective – is exactly what is required when investigating, the point of view of an individual on a training programme (Robertson, 2015), as is the purpose of this research.

Comprehension of what trainees consider crucial in mathematics teacher training is a core of the issue of quality from an individual standpoint. Besides, if the goal is to investigate training quality from this viewpoint, it is essential to identify the features that designate whether these quality proposals are being met. The issue of what to study is problematic as various stakeholders require different outputs (Poell & Krogt, 2017). Equally controversial in the literature of mathematical teachers is that writers disagree about what constitutes a right training course (Alamri et al., 2018; Beswick, 2014; Cave & Brown, 2010; Lipowsky & Rzejak, 2015; Loucks-Horsley et al., 2010; Molande et al., 2017; Pokharel, 2018; Trouba, 2009; Yoon et al., 2007).

Figure 2.3 *Conceptual research framework*

Evaluating training quality based on CAIPO model covers three aspects of mathematics teachers training that provides a narrative of what takes place, attempts to understand the experience of an event or activity from the trainees' viewpoint, possibly based on some of the narrative data obtained from training and investigates specific dimensions and aspects of what takes place. A system approach similar to Easterby-Smith (1994) seems to be the supplest in dealing with the subjective and unique setting of the SIPTT mathematics teacher training.

The conceptual framework has been relied on two theories (a) behavioral learning (Skinner, 1976) and (b) transformational learning (Mezirow, 1995). These theories are compatible with the context of the voluntary training program at the SIPTT under study.

Behavioural learning is a training theory built on the concept that learners realize through interacting with their surroundings. Essentially, it assumes that learners react and conduct based on stimuli-response correlations. Positive reinforcement is quite important in this training theory. For instance, if mathematics trainee teachers at the SIPTT are rewarded each time they top their training module evaluation, then they will most likely accomplish their training tasks at the workplace. By setting up an institutional (i.e., SIPTT) supportive environment that identifies excellent training performance, they will form positive associations with the training programme at the SIPTT and will motivationally continue the next modules in this voluntary programme.

Meanwhile, transformative learning once integrated with scientific methodologies, actively encourages trainees to maximum enhancement the content and transfer of learning experiences and many will appreciate the opportunity to be empowered and involved directly in decision-making of who to apply the new knowledge and skills. Learners who are receiving new information are also assessing their previous ideas and understanding and then transforming their whole worldview as they receive new information and through critical reflection.

Transformative learning explores how learners find meaning in their lives and gain insight beyond simply obtaining knowledge. This type of learning experience necessitates a fundamental shift in learners' perceptions. They begin to question what they previously knew or believed, and study things from fresh angles in order to make place for new ideas and knowledge. Many educational experts think that this type of education leads to true intellectual freedom and knowledge. In this vein, mathematics trainee teachers will judge their previous teaching practices and update them based on the knowledge and skills trained in face-to-face components then applied what suited

the school environment when accomplishing training tasks required.   When trainees transferred the training to schools (workplace tasks application component), the trainees' performance will be improved (Al-Jabri et al., 2018).

2.9   Summary

The review of relevant studies in this chapter centred on the training concept and how mathematics teachers training can be achieved by linking it to the evaluation roles (formative and summative), reviewing eight popular evaluation models, and comparing their strengths and weaknesses. Then, the main critical factors that may influence the quality of mathematics teachers training at the SIPTT based on the best suitable evaluation model to the study context, including context, administration, input, process, and outcome were discussed. Lastly, based on the literature review gap, the conceptual research framework was formulated to guide the present research.

The next chapter discusses the study paradigm, study design, and the rationale for adopting a case study qualitative method, sampling techniques, data collection, and data analysis.

CHAPTER THREE

METHODOLOGY

3.1   Introduction

This chapter offers the methodological account of this research and considers its aspects consistent with the study objectives. The philosophy of the study and the justification for adopting an interpretive stance are presented. Then, a discussion on semi-structured interviews, the sampling technique, and data analysis is offered.

3.2   Research Philosophy

Philosophy is the use of theoretical ideas and beliefs that direct the study (Creswell, 2013). The philosophical assumptions are usually the first concepts in developing research (Creswell, 2013). The researcher's social standpoint informs the ontological, epistemological, and axiological premises of this exploratory qualitative study method (O'Neil & Koekemoer, 2016).

Ontological assumptions offer a guide to access research participants' multiple realities (Creswell, 2013) for how effective the phenomenon of mathematics teacher training in education settings is. Epistemological assumptions contribute to a cooperative and friendly mechanism between the investigator and research participants to co-create knowledge and meaning through constructive experiences (Creswell, 2013). The researcher emphasised co-creating knowledge and meaning with the study participants in the data collection section through in-depth, open-ended, semi-structured online interviews (Dillman et al., 2014). Axiological assumptions provide instructions to the researcher to investigate and define the value systems of the study participants and researcher that affect the research process and context

(Creswell, 2013). The researcher showed respect and built a positive relationship with the participants during recruitment, selection, online interviews, and follow-up processes.

3.3   Research Paradigm

A research paradigm is a deeper philosophical position and organising structure regarding the nature of social structures and phenomena (Feilzer, 2010). In this vein, a paradigm directs research efforts.

Interpretivist paradigm is an approach to a qualitative study that believes that individuals pursue an understanding of the reality in which they work and live. Individuals develop subjective meanings of their experiences as such and interpret the meanings of events directed toward certain things or objects. These meanings are multiple and varied, leading the scholar to look for the complexity of sights rather than reducing meanings into a few ideas or categories (Creswell, 2014).

The present exploratory research approach emerges from an interpretive study paradigm (O'Neil & Koekemoer, 2016). Thus, the identification and exploration of research participants' unique and subjective beliefs of the factors that lead to effective mathematics teacher training offered the foundation for this exploratory qualitative research. The following section identifies and justifies this position in understanding mathematics teachers training quality in the SIPTT.

3.4   Methodological Justification

Past studies in Oman on evaluating training quality practices tended to use either quantitative (Al-Mughairi, 2018; Al-Omrani, 2014), qualitative (Alaraimi & Othman, 2015; Al-Hosni, 2014; Rajasekar & Khan, 2013) or mixed methodology (AlBalushi,

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2018; Al-Jabri et al., 2018). However, regardless of the methodology used, they did not fully capture the common influences of effective training, particularly mathematics teacher training in the SIPTT. One research question guided the study: What key indicators do trainees perceive as being strong/weak in mathematics teachers training programme in SIPTT? The researcher used an exploratory, qualitative, conceptual, thematic research design based on an interpretivist paradigm to better understand mathematics teachers' training quality in SIPTT.

The choice of the qualitative research approach is based on the nature of the study problem (Creswell, 2014). The current qualitative study followed Maxwell's (2013) advice that a qualitative study focuses on three distinct types of questions that are far more appropriately addressed by process theory than variance theory: (1) questions about the meaning of events and activities to the people involved in these, (2) questions about the influence of the physical and social context on these events and activities, and (3) questions about the processes by which these events and activities and their outcomes occurred. The present qualitative study has a particular advantage of pursuing a practical goal of improving the current practices or policies rather than merely measuring the value or impact (Maxwell, 2013). Much could have been lost (e.g., the participants' lived experiences) if this study was limited to conducting a causal relationship between training quality indicators and outcomes using statistical analysis. Instead, this study gave more importance to understanding the quality of the SIPTT training programme, the specific contexts in the Omani public sector, the mathematics teacher training practices. The present research relied as much as possible on the participants' opinions about the quality of mathematics teachers training in the SIPTT. The questions were general and broad so that the trainees could construct the meaning of a situation, usually forged in interactions or discussions with

other persons. The more open-ended the questioning, the better, as the researcher listens carefully to what people are saying or doing in their life settings (Creswell, 2014).

Focusing on the training practices contains considering how mathematics teacher training are carried out in the SIPTT. Process inquiries, particularly for mathematics teachers training quality, aim at understanding and elucidating the internal dynamics of mathematics teacher training programmes. Qualitative inquiry is extremely appropriate for studying processes because describing them needs detailed descriptions of what actually happens and how trainees engage with each other since their experience with the processes usually vary in important ways (Alarcon, 2018). It is, therefore, important to capture their experiences and impressions of their experience in their own words. Understanding practices quality is evaluating routine operations and expected performance and informal trends and unexpected experiences (Patton, 2015). A variety of perceptions may be sought from the participants about the mathematics teachers training, especially those with different work experiences, teaching different class grades, and working in different schools across the country. Furthermore, the respectability and credibility of qualitative methods differ across disciplines, professions, departments of universities, countries, and periods, providing useful and relatable information to the stakeholders, which are part of the programme evaluation to enhance the legitimacy of qualitative methods (Patton, 2015).

In contrast, quantitative research is weak in understanding the context or setting participants live (Creswell & Plano Clark, 2018). Likewise, the participants' voices are not directly heard in a quantitative study, so their personal interpretations and biases are rarely discussed. As part of evaluating the training quality practices in SIPTT, the trainees of cohorts one and two of mathematics teachers were evaluated

quantitatively, and the result was excellent in all aspects (see Table 1.4), which contradicted their result. Bennett (1997) noted that for those in continuing education and health professions, the quantitative method has not always been able to provide helpful answers to address some important questions. A qualitative study makes up for these weaknesses. However, a qualitative study is perceived to be incomplete due to the personal interpretations of the researcher. Also, the resulting bias and the difficulty of generalising the findings to a large group due to the limited number of trainees studied (Creswell & Plano Clark, 2018) is one of the study's limitations. However, it is not fair to use the quantitative criteria of evaluation to assess a qualitative study because both are different in terms of their philosophical bases (Neuman, 2014). Hence, to be respected, qualitative criteria should be used, which was employed by the present study.

3.5   Research Design

Most scholars researching in-service training have used different methods of gathering and analysing qualitative data to explain the benefits and drawbacks of the training (Archibald et al., 2011; Hargreaves & Fullan, 2012). When evaluations are conducted to understand the programme's context, participants' perspectives, the inner dynamics of situations, and questions related to participants' experiences, and where generalisation is not a goal, a case study design, with an emphasis on the collection of qualitative data, might be most appropriate (Preskill & Russ-Eft, 2016). "All evaluation studies are case studies. The programme, person, or agency being evaluated is the case" (Stake, 1995, p. 95).

3.5.1 Case study design

A qualitative case study can be composed to demonstrate a unique case. A case that has an uncommon interest in and of itself and needs to be described and detailed. This is called an intrinsic case (Stake, 1995). Alternatively, the intent of the case study may be to understand a specific concern, issue, or problem (e.g., training quality), and a case chosen to understand the problem best. This is called an instrumental case (Stake, 1995). This study adopted a single instrumental qualitative case study to gather extensive data from trainees' perceptions to understand the programme practices. The investigation provides insight into an issue needing refinement (knowing the strengths and weaknesses of mathematics teachers training) to enhance training quality. Mathematics teachers training at the SIPTT is carried on continuously, so it is not an intrinsic case.

The strength of case studies is their flexibility and ability to assemble a comprehensive array of qualitative data to provide rich analysis and valuable insight (Newcomer et al., 2015). Case studies provide a detailed picture of programme operations, often at some locations, resulting in a deeper understanding of how and why programme operations relate to outcomes. However, case studies are unlikely to be statistically representative, and thus generalising the findings is often problematic (Newcomer et al., 2015). Nevertheless, "thematic generalizability is certainly a possibility" (Creswell & Poth, 2018, p.389). Qualitative data that demonstrates an existing conceptual framework for an issue already reveals the problem's universal character, therefore validating generalisation. Mayring (2007) argued that exploratory case studies do not generate generalisations in the traditional sense but rather generate 'generalised hypotheses' or 'hypothetical generalisations' that may be evaluated for generality in subsequent investigations. They can deliberate on such possibilities or

testable hypotheses empirically. However, the inquirer needs to select representative cases for inclusion in the qualitative study to generalise best (Creswell & Poth, 2018).

Case studies are classified as descriptive, explanatory, or exploratory. A descriptive case study (sometimes referred to as an illustrative study) provides a full and nuanced account of an event in its context. The majority of studies in this category discuss what is occurring and why in order to illustrate what a scenario is like in a small number of occurrences. Explanatory case studies are concerned with creating local cause-and-effect correlations, with the goal of elucidating which causes resulted in which outcomes in a particular setting. Typically, this form of case study discusses an event that occurred in a single or a small number of locations, with minimal emphasis on statistical generalizability. Finally, an exploratory case study is designed to help define the research topics and hypotheses for a following, more comprehensive study. It serves as a guide for the formulation of assessment questions, measurements, designs, and analytic strategies for a broader study (Yin, 2014). Since this research objective seeks to identify the key indicators of the quality of mathematics teachers training, an exploratory case study design was adopted.

Next, the qualitative sampling procedure will be elaborated.

3.6   Qualitative Sampling

The most appropriate sampling technique in qualitative research is nonprobability sampling. Well-known and commonly used nonprobability sampling approaches in qualitative research are purposeful and theoretical sampling (Merriam & Tisdell, 2015). Theoretical sampling is a data collection method to develop theory in which the analyst collects, codes, and analyses his/her data in collaboration with others and determines what data to gather next and where to locate them to construct his/her

theory as it emerges (Glaser & Strauss, 1967 cited in Merriam & Tisdell, 2015). Purposeful sampling assumes that the researcher wants to understand and gain knowledge and must, therefore, choose a sample from which to learn the most (Merriam & Tisdell, 2015). In this study, a nonprobability purposeful sampling approach was chosen because it was more suitable than theoretical sampling to understand the participants' views regarding the quality of mathematics training. Furthermore, since the study concerns the mathematics teachers' training, mathematics teachers and not teachers teaching other subjects were choosing for their perspectives.

Selecting appropriate participants in a qualitative study is a vital issue to meet the study objectives. Some of the more common types of purposeful sampling are unique, typical, snowball, convenience, and maximum variation sampling. A unique sample is based on unique, atypical, perhaps rare attributes or occurrences of the phenomenon of interest. A typical sample would be selected because it reflects the average person, situation, or instance of the phenomenon of interest. Snowball sampling is the most common form of purposeful sampling. This strategy involves locating a few key participants who readily meet the criteria established for participation in the study (Merriam & Tisdell, 2015). When the early key participants are asked to refer to other participants that meet the criteria, the snowball gets bigger and bigger as new information-rich cases are accumulated (Patton, 2015).

On the other hand, convenience sampling refers to exactly what the word implies. The researcher picks a sample based on factors, such as time, money, geography, and the availability of locations or respondents. The convenience strategy selection made on this basis alone is not very credible and is likely to produce "information-poor" rather than information-rich cases (Merriam & Tisdell, 2015, p.

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98). Finally, maximum variation sampling considers "Any common patterns that emerge from great variation are of particular interest and value in capturing the core experiences and central, shared dimensions of a setting or phenomenon" (Patton, 2015, p. 283).

The present study employed the maximal variation sampling strategy to get multiple perspectives about the phenomenon from the participants who differ in some characteristics (Creswell & Poth, 2018), besides enhancing transferability (Merriam & Tisdell, 2015). The logic for using this sampling strategy was to choose mathematics trainees that represented a unique mixture of demographic features: (a) age, (b) gender, (c) location of the school, (d) teaching experience, (e) training cohort, and (f) their training result (see table 3.1). This technique is described as 'a deliberate hunt for negative' of the phenomenon (Merriam, 2009, p.79), which fits with investigating training quality, the core aims of the study. Since it is important to get different trainees' views of the training quality, the present study sought to choose different groups of trainees from the first and second cohort: (a) those who completed the programme successfully (which means that they managed to get a score of at least 50%, and 242 out of 433 met this criterion), (b) those who failed the programme (i.e., scored less than 50%, and 156 out of 433 met this criterion), and (c) those who withdrew from the programme, where 35 out of 433 met this criterion). The rationale for choosing those three different trainees' results (pass, fail and withdrew) is to maximize understanding the quality of a mathematics teachers training. The present study also chose the participants in each group from different educational governorates to enhance the understanding of the phenomenon (Miller, 2002, as cited in Fulmore, 2009). The criteria approach is frequently applied in a qualitative study for selecting

a distinctive characteristic or a group of characteristics found in a population (Teddlie & Yu, 2007).

Based on the defined criteria, the sample was determined by the information given by the interviewees until a saturation point was attained (Merriam & Tisdell, 2015). The concept of saturation has been recommended for achieving an appropriate sample size in qualitative studies. Saturation happens if more perspectives or data cannot be obtained by adding extra participants to the study (Glaser & Strauss, 2006).

3.6.1 Sampling procedure

The researcher used a list of trainees in the first and second cohorts accessible at the SIPTT to choose the participants who met the criteria. Obtaining the list was possible because the researcher is employed there. The trainees were then classified based on their results in the programme (passed, failed, and withdrew). The maximal variation strategy was considered in each group. The following procedure was followed to select the sample from each group.

First, the researcher called the participants to ask for their permission to participate. Their telephone numbers were provided to the researcher by the evaluation department at the SIPTT. Ten online interviews via Zoom were carried out. Due to some technical issue with Zoom, two telephone interviews had to be used. The technology-mediated interviews were employed in consideration of time, cost restraints, and the coronavirus pandemic restrictions. After twelve interviews, the researcher reached the saturation point (seven participants who passed the training, three who withdrew, and two who failed). Notably, most data were obtained from those who passed the programme. The size of 12 participants in this study was consistent with Guest et al. (2006), who found that saturation occurred within the first

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twelve interviews. Additionally, Kuzel (1992) tied his recommendations to a sample of twelve to twenty data sources "when looking for disconfirming evidence or trying to achieve maximum variation" (p. 41).

Twelve respondents from three groups (those who passed, failed, and withdrew) were interviewed in this study as shows on the table 3.1 below.

Table 3.1 Profile of participants

No	Informant ID	Age	Gender	Year of teaching experience	Educational governorate	Cohort	Trainees' Result
1	Info4	35	Female	13	Muscat	Two	Pass
2	Info6	41	Male	17	Ad Dhahirah	Two	Pass
3	Info9	35	Male	12	Ad Dhahirah	Two	Pass
4	Info10	37	Male	14	Al Batinah North	Two	Pass
5	Info11	42	Male	20	Ad-Dakhiliyah	Two	Pass
6	Info13	44	Female	20	Muscat	One	Pass
7	Info14	35	Female	14	Muscat	Two	Pass
8	Info5	42	Male	19	Asharqia North	One	Fail
9	Info7	38	Male	13	Dhofar	Two	Withdraw
10	Info8	36	Male	14	Muscat	One	Withdraw
11	Info12	37	Male	13	Ad Dhahirah	Two	Fail
12	Info15	41	Male	20	Al Batinah South	Two	Withdraw

3.7   Qualitative Data Collection Procedure

3.7.1   Data collection techniques

Three main data collection techniques can be identified in a qualitative study: observations, documents, and interviews. When doing observation, the researcher must be aware of what to see and how to record observations. The second data collecting approach is document and artefact mining. The term "documents" refers

widely to written and other resources pertinent to a research study, such as public records, personal papers, popular media and popular culture, visual documents, and physical artefacts (Merriam & Tisdell, 2015). Interviewing is probably the most common form of data collection in qualitative studies. Merriam and Tisdell (2015) stated that in some studies, an interview is the only source of data.

The present study chose the interview technique to investigate the participants' perspectives on mathematics teachers' training quality at SIPTT. The following details how the interview was carried out in this study.

3.7.2 Interview design

According to Stake (1995), an interview is the main road to multiple realities. The qualitative research interview is further described as "attempts to understand the world from the subjects' point of view, to unfold the meaning of their experience, to uncover their lived world" (p. 3). deMarrais (2004) defined an interview as "a process in which a researcher and participant engage in a conversation focused on questions related to a research study" (p. 55).

Three interview designs can be identified, and they vary in the degree to which interview questions are decided and structured before the interview. The three designs are conversational, semi-structured, and structured (Patton, 2015). However, in a study, a combination of these interview techniques is also possible. A conversational interview is sometimes referred to as "ethnographic interviewing." It is also called "unstructured interviewing" (Fontana & Frey, 2000, p. 652). A guide facilitates the interview to ensure that all critical subjects are discussed (Patton, 2015). The guide offers subject areas through which the interviewer is free to construct a conversation

within a particular subject area, spontaneously formulate word questions, and establish a conversational style but focusing on a predetermined subject matter.

A standardised closed-ended interview involves carefully written and organised questions to bring each participant through the same sequence and ask the same questions in exactly the same words to each participant. Flexibility in probing is more or less constrained, depending on the nature of the interview and interviewers' skills. The disadvantage of utilising a highly organised interview in qualitative research is that tight adherence to planned questions may prevent the researcher from accessing the participants' viewpoints and understandings their perspectives (Merriam & Tisdell, 2015).

On the other hand, a semi-structured interview is utilised to suggest that the process, and consequently, data collected, is formed by both the interviewee and interviewer (Dillman et al., 2014). Semi-structured interviews should provide a rich interpretation of the trainees' experience and view rather than merely presenting snippets of the various phases of this process, as with most evaluation models. Semi-structured interview questions are mostly useful for exploring a person's views (Creswell & Plano Clark, 2018). This format enables the researcher to respond to the situation at hand, the participant's evolving worldview, and new ideas on the topic (Merriam & Tisdell, 2015). Using semi-structured interviews with mathematics trainee teachers achieved the completeness of the evaluating quality from their perception without resorting to conventional methods. Appendix E shows the combination of demographic closed-ended questions and open-ended interview questions.

3.7.3 Developing the interview protocol

A protocol for the interview was created to assist the data collecting procedure during the interview (Creswell & Poth, 2018). The initial interview protocol involved six questions, as follows: (a) Why did you participate in this programme?, (b) What was your experience in this programme? What was your experience in this programme?, (c) Do you think this programme has met your expectation? Why or why not?, (d) What was the biggest takeaway of this programme for you? Why?, (e) In your view, which aspect of this programme was most in need of improvement? Why?, and (f) Is there any comments relevant to what has been discussed before we end our meeting?. These questions were then piloted with three mathematics teacher trainees in the first and second cohorts in August 2020. The pilot interviews were conducted to evaluate the feasibility of interview questions (Merriam & Tisdell, 2015). Based on their feedback, some of the questions were further modified, as follows:

- The second question (What was your experience in this programme?) and third question (Do you think this programme has met your expectation? Why or why not?) were merged into a question (Do you think the training programme has fulfilled your training needs? Why or why not?).

- The fifth question (In your view, which aspect of this programme was most in need of improvement? Why?) was divided into two questions: (a) Did you face challenges in the program? Why?, and (b) Do you think the programme should be improved? If yes, in what ways? What aspects of it needs improvement? If no, are you happy with all aspects discussed throughout the programme? How?

The final interview protocol used in the actual interviews is shown in Appendix F.

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3.7.4 Collecting the qualitative data / implementing the interview

Before the actual data collection, written permission to conduct the study was sought from the MOE in Oman. The letter stated the aim of the present study, the data type to be collected, and the participants. The approval letter from the MOE is shown in Appendix B. After the permission was given, the researcher started the data collection process.

After the participants had agreed to take part in the study, qualitative data were collected. The data collection pursues information from representative samples of people about the real-world processes and events or their experiences (Percy et al., 2015). The theoretical orientation of the researcher, the problem and purpose of the research, and the sample chosen determine the data collection techniques used and the specific information considered to be 'data' in research (Merriam & Tisdell, 2015). According to Merriam and Tisdell (2015), "data collection is about asking, watching, and reviewing" (p. 105).

Due to the coronavirus pandemic and the government restriction, the researcher could not conduct a focus group as planned. Instead, the researcher had to conduct an online interview via Zoom. Before the online interview could be performed, the researcher set up an online appointment to find each participant's best and most convenient time by using phone calls or WhatsApp. The interview protocol prepared prior to the actual interview was used as a guide to ensure that the interviewing session was organised. The interview was done in Arabic to confirm ease in eliciting opinions and views. Before conducting the interviews, the researcher asked permission to record the session.

The online interview started with the researcher informing each participant about the purpose and duration of the research. The participants were also told that

they could withdraw at any time during the data collection period, that their identity would be treated with confidentiality and the data obtained would be utilised exclusively for research purposes, and that they would be presented with summarised research results if they so wish. Since the researcher did not personally know the participants, the research introduction was also meant as an ice-breaking session. An ice-breaking session was to lessen their nervousness and heighten comfort. However, the researcher had to interview some participants via a phone call because of some technical issues. In this situation, the researcher had taken down notes as the recording was going on.

During the interviews via Zoom, the audio was recorded, and in some interviews, audio-visual was recorded based on the interviewee's choice and permission. On the other hand, the audio was recorded during the telephone interviews. Each interview in both methods (zoom and phone) was completed approximately within 30 minutes.

The interviewer used techniques to convey that the interview drew close and diverted participants' attention away from interview topics. The researcher switched off the Zoom recorder or phone audio recorder. He also asked whether the interviewee had anything more to add. Leaving interview participants calmly and optimistically is also a critical component of concluding interviews (Rubin & Rubin, 2011). This is frequently accomplished by returning to the informal chat that preceded the interview (Rubin & Rubin, 2011) to reacquaint the participant with more neutral ground. The participants were eager to discuss the quality of mathematics teachers training directly, and the information provided was highly useful in contextualising and analysing other elements of the data. The researcher was astonished when all participants lauded the training programme, concluding that this was unlikely to be due to individuals

delivering socially desirable replies or being unrealistic. However, the researcher suspected that they might have colluded with him to conclude the interviews positively. It might be a simple contact they liked or one they believed was significant and valuable. The researcher's role is to recognise and accommodate this.

As mentioned, the data obtained from interviews were field notes and Zoom screen recording. The Arabic interview transcripts were back-translation into English by an expert in the training field (see appendix C) (Brislin, 1970). Field notes were systematically documented in protocols. Each protocol was labelled as, for instance, Info4-P, where Info stands for "informant", 4 for "sample number", and P for informant training result (P = passed, W = withdrew, and F = failed). The protocols included the date, and participant's brief background. All data were saved in a computer and organised into distinct folders to facilitate search, access, and sorting.

3.8   Qualitative Data Analysis

Data analysis is "the process of making sense out of the data" (Merriam, 2009, p.175). Creswell and Poth (2018) mentioned that "data analysis in qualitative research consists of preparing and organising the data for analysis, then reducing the data into themes, through a process of coding and condensing the codes, and finally representing the data in figures, tables or a discussion" (p. 251). According to Brod, Tesler, & Christensen (2009, p. 1268), interpretative research is to "generate new information regarding the topic of interest based on previously identified possibilities, as well as newly provided information from the research participants".

Naturally, in the current study, the collected data were analysed according to the research questions. Nevertheless, the process of analysing and interpreting data was continuous, as this research discovered new information every now and then. For this

reason, the current study followed closely, if not all, the seven-step analysis procedure

suggested by Adu (2019) that indicated in table 3.2.

Table 3.2 Manual data analysis procedures

Steps	Clarification
1. Assign labels to the research questions (anchor code).	- **Informant10 statement:** Previous trainees encouraged me to join the program. - **Anchor code:** Program strength.
2. Using specific coding methods, code relevant statements and put them under their respective anchor codes	- **Coding method:** Interpretation-focused coding. - **Anchor code:** Strength - **Code:** Peer support.
3. Compile a list of initial codes/ data.	- *Strength:* Info4: "I knew the training programme from my colleague (a former trainee in the first batch) because some tasks required to be accomplished in the programme were colleagues' participation in some training tasks to exchange experiences. I was with her as a cooperating colleague during the completion of her required tasks (such as photographing the required applied lessons)." - *Strength:* Info5: "I knew the programme through the non-trained senior mathematics teacher and principal who nominated and encouraged me to attend the programme." - *Strength:* Info6: "Graduate trainee's practices influenced me to join the program." - *Strength:* Info10: "Previous trainees encouraged me to join the program to learn about modern teaching methods, refine skills, apply strategies and employ technology in teaching." - *Strength:* Info11: "...trainees in the school previously enrolled in the training programme encouraged me to join. They played a significant role in motivating me to participate. The senior mathematics teacher who was a former trainee in the programme partially transferred the training." - *Strength:* Info12: "The graduate trainees had a significant role in encouraging me to attend the program."

Steps	Clarification
	- Strength: Info14: "…one of my colleagues is always motivated and strives for change. She is a trainee in another training program. She mentioned that she enjoyed and benefited from the program a lot. She motivated me to enrol"
	- Strength: Info15: "Graduate trainee convinced me to join the program."
4. Arrange them alphabetically and group codes into their respective anchor codes.	*- Strength:* Info10: "Previous trainees encouraged me to join the program to learn about modern teaching methods, refine skills, apply strategies and employ technology in teaching."
	- Strength: Info11: "...trainees in the school previously enrolled in the training programme encouraged me to join. They played a significant role in motivating me to participate. The senior mathematics teacher who was a former trainee in the programme partially transferred the training."
	- Strength: Info12: "The graduate trainees had a significant role in encouraging me to attend the program."
	- Strength: Info14: "…one of my colleagues is always motivated and strives for change. She is a trainee in another training program. She mentioned that she enjoyed and benefited from the program a lot. She motivated me to enrol."
	- Strength: Info15: "Graduate trainee convinced me to join the program."
	- Strength: Info4: "I knew the training programme from my colleague (a former trainee in the first batch) because some tasks required to be accomplished in the programme were colleagues' participation in some training tasks to exchange experiences. I was with her as a cooperating colleague during the completion of her required tasks (such as photographing the required applied lessons)."
	- Strength: Info5: "I knew the programme through the non-trained senior mathematics teacher and principal who nominated and encouraged me to attend the programme."
	- Strength: Info6: "Graduate trainee's practices influenced me to join the program."

Steps	Clarification
5. Group codes and tally frequencies.	- *Strength:* Peer support. - **Frequencies:** 8 (info10, info11, info12, info14, info15, info4, info5, info6).
6. Generate categories/ themes to address the research questions.	- **Sub-theme:** Supportive workplace environment. - **Theme:** Context.

7. Visualise codes, categories and themes generated.

Theme	Sub-theme	Code	Data
Context	Supportive Workplace environment	Peer support	Info10: "Previous trainees encouraged me to join the program to learn about modern teaching methods, refine skills, apply strategies and employ technology in teaching." Info11: "...trainees in the school previously enrolled in the training programme encouraged me to join. They played a significant role in motivating me to participate. The senior mathematics teacher who was a former trainee in the programme partially transferred the training." Info12: "The graduate trainees had a significant role in encouraging me to attend the program." Info14: "…one of my colleagues motivated me to enrol."

Theme	Sub-theme	Code	Data
			Info15: "Graduate trainee convinced me to join the program."
			Info4: "I knew the training programme from my colleague (a former trainee in the first batch) because some tasks required to be accomplished in the programme were colleagues' participation in some training tasks to exchange experiences. I was with her as a cooperating colleague during the completion of her required tasks (such as photographing the required applied lessons)."
			Info5: "I knew the programme through the non-trained senior mathematics teacher and principal who nominated and encouraged me to attend the programme."
			Info6: "Graduate trainee's practices influenced me to join the program."

First, the data from the field notes and recordings were transcribed in Arabic and then back-translated into English to begin the analysis. Because the topic matter in this study was not intimate or sensitive, a verbatim level of transcription was not necessary; instead, the analysis of the conversation content was retained, not the recording. Some believe that a thorough verbatim transcription hinders rather than helps a research project. For example, Frisch (1990) claimed that the more exactly the voice is copied to give it prominence, the higher the risk that the transcription would become unintelligible.

Guided by the literature analysis, emergent topics from the interviews were thrown in for good measure. They varied in length, from small sentences to lengthy quotes. This method of first employing themes from the studies was followed to serve as an initial argument for analysing a large quantity of data (nearly seven hours of interview recordings) and, later, to enable contrasts between existing studies and interview data. When the coding was finished, the new, emergent codes were grouped into broader thematic groups that corresponded without bias and objectively with the earlier determined classes.

The interviews were reviewed in three ways after being transcribed but before codified (Thompson, 2000). First, they were looked at as a whole as text to see if there were any overarching themes, repetition, or images. Second, they were compared to objective, verifiable components (places, times, etc.) and subjective thoughts, impressions, and feelings. Lastly, it is critical to know how trustworthy or typical a witness is. Each interview was analysed for "internal consistency" to assess dependability (Thompson, 2000, p. 272) to allow the researcher to determine if individuals truly remembered or just reflecting on their previous mathematics teachers training experiences.

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The transcribed interviews were classified in two sub-domains following this first evaluation: the themes that arose from the pilot research and the previous studies, and new classifications were established as required (Brod et al., 2009). This was tried by hand for the pilot. There was no intent to utilise software to create figures or statistics because this was interpretive research. Using words or phrases that arose from the interview data, new sub-codes were generated. Although early coding frequently analysed smaller data chunks rather than larger ones, these data units varied in size from paragraphs to sentences, phrases, and even single words (Saunders, Lewis, & Thornhill, 2012).

The codes were coded and condensed to reduce the data into CAIPO themes. Then, the data were summarised in figures, tables, or a discussion (Maxwell, 2013). Coding was performed by developing codes for the transcribed interviews. The researcher coded and analysed the data to organise the information based on the CAIPO model to facilitate interpretation through the use of descriptive keywords (Catterall, 1996). Qualitative coding, which is a sub-category of qualitative analysis, is a systematic, subjective and transparent process of reducing data to meaningful and credible concepts which adequately represent the data and address the research problem, purpose, or question(s) (Adu, 2019).

Three main coding strategies are available: description-focused coding, presumption-focused coding, and interpretation-focused coding (Adu, 2019). Description-focused coding involves describing events, settings, behaviours, experiences, or stories. This strategy is similar to descriptive coding, which "summarises in a word or short phrase – most often a noun – the basic topic of a passage of qualitative data" (Saldaña, 2016, p. 102). Presumption-focused coding involves making conclusions about what the researcher has initially observed in his

data and matching the claims against new data with the aim of refining or rejecting the claims. Interpretation-focused coding strives for meaning-making that is the main characteristic of this coding strategy. It involves identifying significant information in the data and developing a code that represents an understanding of the information (Adu, 2019). This coding strategy fits with this exploratory interpretative study to understand mathematics trainee teachers' perspectives.

Following the first data codification, the newly produced codes grouped the new tiny data units into higher-level categories based on emerging themes. These wider groups made it easy to compare and contrast the various interviews (Saunders et al., 2012), which was an ongoing process, with the codes and themes being reassessed as new information emerges from the data. The technique of coding followed by arranging the ideas generated into themes representing the interviewees' responses. Codes were further analysed to form themes. Each theme represented a broad, meaningful idea representing the participants' point of view conceived from coding analysis (Creswell, 2013). Lastly, the themes were organised for interpretation using simple frequency analysis.

Nearly all scholars express strong caveats about using computer-assisted tools when dealing with case study data. Indeed, most case studies pose a severe challenge of using computer-assisted tools (Yin, 2014). Hence, manual coding and analysis for this study were adapted from (Adu, 2019; Saldana, 2016). Because this approach of classifying and analysing data is interpretive and hence extremely subjective, questions about the validity of the results emerged. One typical critique of qualitative study is that generalisation cannot be formed from such tiny sample size, raising concerns about the trustworthiness and validity of any study findings (Brod et al., 2009). Other sorts of studies may be utilised to prove this if needed, and qualitative

study is more about comprehending individual perspectives than describing generalised phenomena (Creswell & Poth, 2018), according to one rebuttal to this issue. Rather than establishing a single, unified theory, the goal of this research was to examine subjective interpretations of reality. Reliability and validity have been viewed as intricate in interpretive, qualitative study (Saunders et al., 2012), where establishing generalisability or replicability can be challenging. These issues are addressed in the sections that follow.

3.9   Research Trustworthiness

All research is concerned with generating valid, reliable, and ethically sound information (Merriam & Tisdell, 2015). The researcher depends on four criteria recommended by Lincoln and Goba (1985) for establishing the trustworthiness of the results in the present study. These authors described one alternate set of criteria that parallel quantitative research validity and reliability criteria. The criteria are credibility (quantitative internal validity), transferability (quantitative external validity/generalizability), dependability (quantitative reliability), and conformability (quantitative objectivity). As Stake (2005) stated, the knowledge gained in an investigation faces dangerous passages from writing to reading.

3.9.1 Credibility

Internal validity raises the issue of whether study results correspond to reality (Merriam & Tisdell, 2015). Internal validity deals with how research findings match reality (Merriam & Tisdell, 2015). Internal validity indicates to demonstrating that a study method is measuring what it is supposed to assess. Nevertheless, this research

did not focus on explanation or measurement but on attaining an understanding of persons. Evidence of credibility was obtained in this study using triangulation.

Triangulation means gathering and analysing data from multiple sources to get a wider view of the situation under investigation (Lacey & Luff, 2001). According to Lincoln and Guba (1985, p. 315), triangulation is "a process carried out with respect to data—a datum or item of information derived from one source (or by one method or by one investigator) and should be checked against other sources (or by other methods or investigators)". One essential distinguishing triangulation feature is identifying ambiguity and locating different viewpoints (Patel, 2007). Lincoln and Guba (1985, p. 315) proposed that triangulation enhances the researchers' way of investigating, validating, and interpreting the results.

Triangulation, as already stated, is an essential step in creating credibility in a qualitative study. Three methods of triangulation were employed in the current research to achieve this goal. The first was triangulation among sources involving verification by multiple sources of similar data (Lincoln & Guba, 1985), i.e., data were collected from mathematics trainee teachers at different levels of teaching experience (see table 4.2). Secondly, triangulation was employed through various locations where data were gathered from seven MOE affiliated directorates. In terms of demography and location, those directorates are different (see table 4.2). Thirdly, the researcher compared study findings to the content of a mathematics training programme at the SIPTT (e.g., see table 1.2). Triangulation is important in broadening the knowledge of the researcher and gaining more insight from the different data sources. It also allowed the researcher with the opportunity to perform an in-depth analysis and express the opinions and views of the participants on the various aspects of mathematics teachers training related issues within the SIPTT.

3.9.2 Transferability

Another trustworthiness criterion is transferability, which concerns how the study findings can be extended to samples and similar settings (Shenton, 2004). Seale (1999) argued that transferability is accomplished by presenting a detailed, rich explanation of the settings examined to provide ample details for the reader to determine the applicability of the results to other settings they know. This includes a detailed description of the phenomena under investigation and its meaning in relation to the phenomenon that occurs. The quotes from the mathematics teacher trainees was another tool used to retrieve the data structure (e.g., see section 4.4.1, p.115). Additionally, the purposeful maximal variation sampling technique (see section 3.6) was used to thoroughly investigate the participants' wider variety of perspectives. According to Merriam and Tisdell (2015), this technique "enhances transferability" (p. 257). Parr (2010) asserted that purposeful sampling supports a study's transferability by maximising the gamut of information obtained.

3.9.3 Dependability

From a qualitative point of view, dependability is relevant to the consistency of integrated data collection and data analysis processes and procedures (Lincoln & Guba, 1985). Seale (1999) noted that dependability could be accomplished by auditing that contains of recording data, processes, and decisions taken by the researcher during data analysis and the stage of outcomes. In this study, the researcher clarified the training evaluation models and theories underlying the research (see section 2.4) and provided more descriptions and details on how data were gathered (see section 3.7.4) to allow for an audit trail to fulfil these criteria.

3.9.4 Conformability

Conformability refers to the degree to which certain parties may validate or confirm the findings of the study. Conformability was obtained in this study by involving mathematics teacher participants in the review of the transcripts to increase the accuracy and quality of data analysis (Sarantakos, 2005). Each participant was sent a copy of their transcription for consent and requested to read it over and make any necessary change, update, or delete. Raw data were documented in great detail, including audio recording and transcription.

3.10 Summary

This chapter outlined the qualitative methodology applied to this study. The research was conducted using a case study method to understand and interpret the experiences of mathematics teacher trainees at the SIPTT and their perceived quality of the programme. Data were collected using online semi-structured interviews. Interpretation-focused manual coding was performed to generate themes guided by the CAIPO evaluation model. The validity of this study was enhanced via recording and participant checking. Ethical research consideration was followed to eliminate potential academic violations.

CHAPTER FOUR

FINDINGS

4.1   Introduction

Three study questions were developed (section 1.3) from the literature review: (a) what are the key indicators do trainees perceive as strengths in the mathematics teachers training programme in SIPTT?, (b) what are the key indicators do mathematics teachers perceive as being weak in mathematics teachers training in SIPTT?, and (c) What are the main indicators for evaluating the quality of the training program at the SIPTT?.

Easterby-Smith's (1994) training evaluation framework was found to be the best model to investigate these concerns through in-depth online interviews with course participants.

This chapter presents the results of the interviews. It begins with a description of the demographic feature of the participants. Brief thematic categories are presented. The findings of these themes are the presented. Each section represented a theme. Each section concludes by presenting the findings of the theme classify into the strengths (first research question), weaknesses (second research question). As a result, the proposed training evaluation (third research question) are formulated based on the key indicators of the quality of mathematics teachers training from participants' perspective.

4.2   Findings

4.2.1 Profile of participants

Based on the participants' profile presented in table 3.1 (see section3.6.1, p.84) Of 12 respondents 58.3% were between 35 and 38 years old, while 41.6% were between 41 and 44 years old. On teaching experience, 58.3% had teaching experience between 12 and 15 years, while 41.6% had between 17 and 20 years of experience. Since the programme was not mandatory, one of the criteria for selecting a candidate is that he/she should have teaching experience of five years or more. In terms of gender, 25% of participants were women, and 75% were men. Many more men were in the second cohort than women. Only a quarter of them was from the first cohort, while 75% were from the second cohort. More took part in the second cohort because much time had passed since the first batch was taken in 2014. Also, during the pilot study, the researcher found that some trainees who attended in the first cohort had changed their job titles.

Respondents were from seven different educational governorates over the country. In terms of trainee results, 58.3% passed the program, 25% withdrew from the programme, and 16.6% failed the programme. Those who passed had a comprehensive overview of the program.

4.2.2 Thematic categories

Five elements were thematically established from previous studies to be utilised as a basis to probe the participants' perceived quality of a mathematics teachers training at SIPTT. The elements were *context* (supportive work environment and professional learning communities), *administration* (policies and procedures), *inputs* (training

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design, content, facilities, trainer competencies, trainee characteristics), *process* (trainer's delivery, trainer follow-up, and feedback), and *outcomes* (trainee satisfaction, teacher skillset, teacher productivity, and research skills). These factors were identified as possible critical indications by which participants in a mathematics teacher training programme evaluate the program's quality. The first and second order themes identified in the interview transcript are utilised as a construct to analyse the data.

In details, appendix (H) a labelled excerpt from an interview transcript is provided as strengths of the programme, appendix (I) indicated the weaknesses the program, and appendix (J) specifies the participants' recommendation to improve the quality of the programme.

The rest of this chapter is split into five sections based on the first-order themes. It is then subdivided into smaller parts as needed to address particular concerns raised by the second-order topics. Tables in this chapter summarises the perceived quality assessment (strengths and weaknesses) of each theme from the participants' perspective.

4.3 Training Context

One concern developed from the literature is how the work environment influences the perceived quality of mathematics teachers training. The findings indicate that the work environment seems to affect the perceived quality of the training programme. The present study also reveals an emergent theme of professional learning communities in influencing perceived quality.

4.3.1 Supportive work environment

Context was created by recognising the contention that a supportive work environment is based mainly on practices and experiences and that may differ from an official training setting (Davies, 2000; West, 2003).

The present findings highlight two primary areas of support influencing the first attendance in the training programme identified by the participants. They were the principal support and peer support.

The encouragement and support demonstrate the conviction of school principals and senior teachers of the usefulness and quality of the programme for the trainees. The principal support placed on such courses by the participants also defined their unique course expectations, as shown in the following excerpts:

"The principal had a significant role in encouraging me to enrol in the programme."
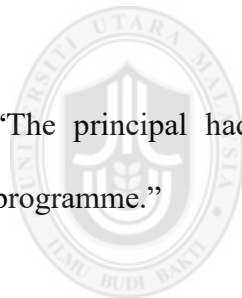
(Info8-W)

"I knew the programme through the non-trained senior mathematics teacher and principal who nominated and encouraged me to attend the programme."

(Info5-F)

"I knew the training programme from my colleague (a former trainee in the first batch) because some tasks required to be accomplished in the programme were colleagues' participation in some training tasks to exchange experiences. I was with her as a cooperating colleague during the completion of her required tasks (such as photographing the required applied lessons)."

(Info4-P)

One of the most noteworthy themes to emerge from the interviews was the effect of pre-course expectations on participants' perceived quality evaluation and the influence of word-of-mouth references, nearly peer support, that appeared to drive the first attendance. The majority of the participants stated that peer endorsement was a factor in their decision to attend the mathematics teachers training at SIPTT. Peer support was also reported to be a positive influencer of motivation and volition.

> "...trainees in the school previously enrolled in the training programme encouraged me to join. They played a significant role in motivating me to participate. The senior mathematics teacher who was a former trainee in the programme partially transferred the training".
>
> (Info11-P)

Additionally, the sub-themes extracted from interviews related to the context of the work environment focus on two aspects: The first is the alignment of training context with actual teachers' work. Specifically, Info4-P stated that some lesson plans in the training programme were different from what was actually being practised by the mathematics teacher in the school. She pointed out a mismatch between the training content and the training tasks to be accomplished concerning the actual teaching practices in the classroom. Although the rest of the interviewees did not mention this point made by the trainee Info4-P, three of them (Info7-W, Info13-P, and Info14-P) mentioned a similar context that teaching models adopted from some educationally advanced countries and including them in the training content might not be compatible with the Omani classroom environment due to the different circumstances.

"The use of educational models in the training material from foreign countries differs from Omani students' culture. Indeed, most of the students in those countries are prepared, and their conditions are entirely different from the conditions of the Sultanate's school students".

(Info7-W)

Despite the value of using foreign teaching models to develop Omani teacher education practices, using foreign teaching models and asking the trainees to apply them in their schools as training tasks did not convince some of them. This was because of their fear that they would not succeed due to the different classroom environments. Therefore, some suggested including Omani teaching models in the training content to be more accurate to ensure its success in the Omani classroom. This opinion was contrary to what was stated by Info4-P, Info6-P, Info9-P, Info11-P, and Info15-W in Section 4.5.2. They considered that learning from foreign models in teaching is among the strengths of the training content in the programme. They could adapt these models when applying them, which helped them update their teaching practices.

Secondly, Info8-W alluded that he faced difficulty when implementing the training tasks in the workplace environment because of the lack of support from the school administration, who might not be aware of what was required of the trainees to implement in the school to enable them to complete the requirements of the training programme.

4.3.2 Professional learning communities

The mathematics teachers training familiarity with a work environment indicates the importance of forming professional learning communities. The participants

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interviewed were teachers with more than ten years of work experience and recognised that creating a professional learning community in the workplace is essential to boost the quality of the training programme. The establishment of learning communities within the school and professional communities could include teachers from other schools where teachers collaborate and learn from one another via the sharing of personal experiences.

> "The training programme facilitated exchanging trainee teachers' experiences in the same field of specialisation. The training programme enhances the teacher's confidence to express and discuss his views and training method encouraged the trainee to share his experiences."
>
> (Info4-P)

The professional learning community models the self-initiating learner working in concert with peers. In other words, learning is most productive in a social context. Hence, based on the evidence presented, the importance of professional learning communities that enhance the value and quality of the training programme is apparent. Forming professional learning communities are among the objectives of the training programmes at the SIPTT so that participants can share knowledge and exchange experiences to achieve positive change in the development of teachers' performance. That is in line with the Info10-P statement:

> "Some of the advantages of the programme are; first, discussion with trainee teachers on implementing the required tasks, discussion and dialogue in the educational platform, exchanging experiences between teachers enrolled in the programme".
>
> (Info10-P)

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Professional learning communities may be the way teachers could continually learn and develop new skills for teaching and learning in their workplace environments (Owen, 2016). Furthermore, the shared values serve as collective affirmation of the quality of mathematics teachers training. Even though the present study did not focus on the notion of professional learning communities per se and whether they influence the conformity of opinions within trainee groups, from these interviews, it reflects that such communities shape the participants' view of initial perceived quality and allow a greater understanding of individual perception.

In sum, the findings suggest that the training programme is directly related to professional learning communities that participants form while attending mathematics teacher training courses and to training quality. Table 4.1 summaries the main findings of the key strengths and weaknesses in the context theme.

Table 4.1 *Context Quality of Mathematics Teachers Training Programme at the SIPTT.*

1st Order Themes		2nd Order Themes	
		Strengths	Weaknesses
Context	Supportive Work environment	The school principal encouraged teachers to join the programme. Graduate trainees encouraged other teachers to join the programme. Non-trained teachers supported trainees. The positive change of trained teachers motivated teachers to join the programme. Trainees were encouraged by the surrounding workplace to transfer the training.	Some lesson plans in the training content was unrelated to teachers' daily work. Foreign educational models did not fit Omani classroom. Some principals did not support transfer training, especially, during the implementation of training tasks.
	Professional learning communities	This programme enhanced PLC.	-

4.4 Administration

According to the CAIPO model, such administrative issues could influence training quality. The study findings showed that most of the challenges facing the trainees in the program were concentrated in administrative aspects.

4.4.1 Policies and procedures

The administrative procedures in the mathematics teachers training programme are considered the second element in the CAIPO training evaluation model. The interviews revealed two administrative advantages that appear to motivate the participants to participate in the training programme provided by the SIPTT. First, the administrative circulars issued by the SIPTT to schools are a factor in giving teachers a brief overview of the training programme and its objectives, encouraging them to join the programme. This is because the circulars had created a perception of the programme's importance and its suitability and quality, which the participants considered the programme strength, convincing them to enrol.

> "In fact, when we received the circular from the Specialised Institute that explains the training goals to increase teachers' expertise and skills in educational practices. So, that convinced me to join."
>
> (Info8-W)

> "…after taking a brief overview of the training program, I agreed to participate. When the training program objectives were well clarified for the teachers, they expressed their enthusiasm to compete in joining the training program."
>
> (Info5-F)

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Secondly, the administrative strength of the programme is that it released the participants from weekly school and work duties to accomplish training tasks (workplace task applications component).

"One of the programme's advantages is that SIPTT provides trainees one-day exemption from work duties to accomplish the training tasks."

(Info11-P)

Institutional support is an influential factor in encouraging trainees to complete the training tasks required to transfer the gained skills to the classroom environment. Such support is also necessary to help organise trainees' time between work duties and accomplish the training tasks. The SIPTT's intangible rewards policy (one-day release) seemed to influence the extent of the application of acquired training to assignments (i.e., training transfer).

One of the obvious challenges extracted from the interviews was the administrative theme before and during the training programme. The MOE has developed some administrative procedures to boost the transfer of the training to the trainees' workplace, such as releasing them for one day weekly from their school and work duties. Although some participants considered the release an advantage of the programme, others did not. Furthermore, several participants (Info7-W, Info8-W, and Info13-P) said that the support provided by the SIPTT to the trainees by releasing them one day of work increased the teacher's work on other days. Info13-P reported that her school timetable was overloaded with much administrative work added to her teaching schedule. She felt at that time that she was behind the syllabus plan.

Similarly, Info7-W and Info8-W stated that this was one of the reasons they withdrew from the non-mandatory training programme due to the backlog of schoolwork.

"One of the reasons for the withdrawal is … classes accumulate due to the release of one day a week from work duties to do training tasks. Hence, it is not easy to finish the curriculum according to the specified period."

(Info13-P)

In addition, some participants (e.g., Info14-P) indicated that the duration of five days for face-to-face training in each module is insufficient for the intense training content because the trainer could not explain more but was forced to limit himself nuggets and excerpts to manage the training time. Similarly, Info4-P, Info11-P, and Info14-P criticised the timing of the face-to-face training, which extends for a week for each module. This means that lessons are lost for a week and must be replaced later, which causes a great burden on teacher trainees.

Likewise, some participants faced challenges when applying some training tasks to the school.

"I also faced a lack of acceptance from the school administration with conducting training workshops for my fellow teachers and transferring the programme's experience to them so that the benefit is widespread for all. That is because the ministry did not put in place regulations that serve the training transfer process."

(Info8-W)

Additionally, according to Info8-W, he failed to conduct training workshops to transfer training to his colleagues at the school. Other participants (e.g., Info4-P, Info6-P, Info8-W, and Info11-P) also reported the poor cooperation between SIPTT and schools, negatively affecting them. Info6-P elaborated this issue in more detail.

"Sometimes, I feel there is no coordination between the school administration, educational governorates, and the SIPTT. For example, the administration does not consider the high quantity of mathematics classes for trainees. From my perspective, it is preferable to consider the teachers enrolled in the training programme. The class load should be reduced when joining the programme. It is preferable to set a ceiling as an upper limit of mathematics classes. For example, about 14 classes weekly. That would give the teacher motivation to join the programme, especially those who were hesitant.

While some school administrations understand and consider the teacher who enrolled in the programme, most of them do not consider this aspect and say that the teacher is an employee and has the same responsibilities as other colleagues. Some principals do not have a background in the training tasks required. Thus, there may be a gap between the school administration, educational governorates and the SIPTT."

The statement above describes the importance of the coordination between the SIPTT and schools to facilitate the trainee to perform the training tasks and relieve the work pressure he/she faces due to the difficulty in balancing training attendance and teaching many lessons along with other tasks related to the schoolwork.

Participants also indicated another weakness of the training programme. There was no clear selection and nomination criteria for trainees to attend despite the programme being non-mandatory and targets mathematics teachers who have teaching experience of five years or more.

Another challenge extracted from the interview is that the trainees' grading system is limited to giving one of the two results, either pass or fail, without detailing

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the trainee's performance level, excellent, very good, acceptable, or fail. This detail gives a clear picture of the trainee's performance and motivates him/her to achieve a higher level in the upcoming mathematics teachers training module. Furthermore, Info11-P stated that among the weaknesses of the mathematics training programme is the subjectivity of the trainee's performance, resulting in poor accuracy and credibility.

Another essential point highlighted by many participants was the value of the training certificate. Info4-P stated that the programme certification very much motivated her to join the programme because this training will enhance her future prospects.

"I considered joining this training programme as an opportunity for professional development and an alternative to studying for a master's degree…I hope that the training programme certificate would be equivalent to a master's degree if another semester were added to the programme. The certificate made us disappointed."

(Info4-P)

However, many interviewees revealed that the training certificate did not add value to their profession. Even though the mathematics teachers training programme extends for two years and the one who passed the programme is given a diploma in professional practices, it was not linked to the career path of the trainee. The trainees still questioned the usefulness of this certificate in the future.

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"Certification is also an essential factor in attracting trainees. When we saw that the certificate is a diploma and has no real value in our career, we were incredibly frustrated."

(Info14-P)

Similarly, Info4-P, Info11-P, and Info13-P strongly agreed with the Info14-P perspective. They stated the difficulty of balancing between joining the training programme and completing all the required training tasks in light of many teaching classes and other non-teaching schoolwork, with the training certificate not adding value to them in the short term. Table 4.2 abstracts the main findings of the key strengths and weaknesses in the administration theme.

Table 4.2 *Administration Quality of Mathematics Teachers Training Programme at the SIPTT.*

1st Order Themes		2nd Order Themes	
		Strengths	Weaknesses
Administration	Policies and procedures	SIPTT admin circular convinced teachers to join the programme.	One workday release caused the accumulation of classes in other working days.
		SIPTT provided one-day release from work duties to accomplish training tasks.	Limited time for face-to-face training. Poor collaboration between SIPTT and schools. Unclear mechanism for transferring training into workplace. Random selection and nomination of trainees. Lack of grading system of trainees' result. Subjectivity in training tasks grading. Training certificate has vague value in teachers' career.

4.5 Input

The interviews showed that the sub-themes under the training input include training design, content, facilities, trainer competencies, and trainee characteristics.

4.5.1 Training design

The design of the training programmes at the SIPTT is fundamentally different from other training programmes in the MOE in terms of how they are delivered (see Figure 1.1). Therefore, most participants considered the delivery method a strength of the programme because it combines face-to-face training, online training, and the application of work tasks. Concerning the first element, trainees physically interact with the trainer and other trainees for a week. The second component is an online training, which aims to enhance the trainee's knowledge. The application of workplace tasks aims to transfer knowledge and skills to the school environment.

> "SIPTT training goals are to increase teachers' expertise and skills in educational practices. So, that convinced me to join, especially the training courses and workshops conducted last time in the educational governorates were all routine, and their usefulness was barely mentioned. So, I consider this programme as one of the reasons for improving the educational level to a higher one."
>
> (Info8-W)

Additionally, Info12-F shared the same sentiment:

> "We were not used to attending such a practical training programme. It was interesting. It encouraged us to complete the programme…We enjoyed attending the programme. We noticed that this training programme is positively different from the previous educational training."

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According to Info8-W and Info12-F, the design of the mathematics training programme at SIPTT reflects the strength and the quality of the programme compared to previous training programmes conducted in educational governorate training centres. Likewise, Info12-F considered the training period, which extends to two years, is an advantage to help trainees consolidate the practical application of training to become daily practices at the school. In this way, the performance of the trainee gradually develops.

"The training programme has sufficient time to implement and practise. The two-year training programme strengthens the training information and skills."

The program consists of three different components (face-to-face, online, and workplace tasks applications) as depicted in figure (1.1). From the interviewees' perspective, the face-to-face training (first component) in the programme is considered the best because it allows them to interact directly in the training room.

"…trainee colleagues are cooperative. The point that motivated me the most was trainees' presence with less practical experience than me in terms of the number of years, but their performance in the training room was distinguished. One of the things that I liked about training was the face-to-face interaction of trainees in the training room."

(Info5-F)

Additionally, the face-to-face training environment has a major role in the success of the mathematics teachers training process, as indicated by it Info12-F.

"Moving to the SIPTT in Muscat gives the trainee motivation to attend. It is something different from attending training programmes in the same area. This

programme is one of the best training programmes in MOE. It helps teachers excellently."

This statement revealed that the trainee considered the unique design of this programme and the positive results gained (to be discussed in the next sections). Likewise, the online training of the mathematics teachers training (second component) is designed to boost the trainees' knowledge. Info4-P stated:

"The educational platform in the online training helped me as well. It contained enriching materials. I used some to summarise mathematics lessons. Also, I benefited from it in carrying out some workshops for my colleagues on how to implement some teaching strategies (such as learning by playing, problem-solving, and active learning)."

SIPTT intentionally designed workplace tasks applications (third component) to enrich training transfer to school environment. Info14-P expressed:

"The application of workplace tasks was fascinating. I liked this part of the training because I practised most of the strategies that I have trained on in the classroom environment. I enjoyed applying these strategies in the workplace. During the application, it becomes clear to the trainee how much benefit from the training programme and the aspects that need to be developed and strengthened."

Even though the training design is different from that in the educational governorates, Info12-F found it challenging to understand the course of the training and what was required. It is not surprising that Info12-F trainee complained about the difficulty of understanding the design of the training program because teachers were not used to attending such a training programme that has three components (face-to-face training, online, and workplace task applications), as these components were designed in a cumulative, sequential manner.

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4.5.2 Content

In this study, content refers to the material employed in training, and two primary concerns emerged: (a) whether trainees prefer applications to theory in the programme material and (b) whether they are satisfied with general content or are they have robust views about the material's relevance to their particular workplace environment. To address these concerns, the first sub-section examines the introduction of practical activities into training before examining whether these exercises should be specially customised to the attendees' job.

This study found that the participants had a favourable perception of the training content. They perceived importance in hands-on activities to increase the programme practicality. The present study showed the fundamental value of ensuring that relevant training content is easy to apply back in the workplace. Furthermore, the practical activities and exercises during the training were found to be crucial in allowing the transferability of the training content.

Info4-P, Info8-W, Info11-P, and Info14-P shared the same point about the programme content being practically compatible with the mathematics teaching practices. They claimed they were sufficiently competent to draw the connection between their previous practices and their present one on their own, allowing for higher transferability of learning.

Furthermore, all participants agreed that the opportunity to apply skills during training sessions increased their learning experience. Rather than depending simply on theoretical face-to-face training, it was the utilisation of exercises, case studies, and international teaching methods that reinforced the abilities. Info10-P demonstrated that he could read and synthesise the material presented in face-to-face training and the theoretical knowledge contained in the online platform for practical application.

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"The training content is a sequence and adequately studied, such as the theoretical and practical side. The programme design concentrated on implementing strategies and conducting action research."

(Info10-P)

One of the key arguments that emerge from this statement is that the matter of the case studies or exercises utilised was mainly relevant, according to Info6-P. He found the chance to use his knowledge especially valuable. This is consistent with the early comments of Info-5-F (19-year experience) and Info7-W (13-year experience), who stated that despite their teaching experience, the programme's content added new knowledge and how it could be applied in the classroom enhance the strength of the programme.

Moreover, Info11-P stated on his preference for a practical feature in the foreign teaching models included in the training course. He argued that for a purely scientific subject such as mathematics to make sense, it is necessary to be aware of the practical elements. Similarly, according to Info14-P, the practical components consolidate the instruction and enable her to transfer the abilities acquired throughout the course to her own work. She starkly contrasted her previous training experience with the mathematical training programmes attended, "In fact, we were attending training workshops in the governorate training centre, whose benefit was limited in terms of educational developments." She considered the mathematics teachers training to be more than "just another workshop" because of the applicable feature of the materials and exercises.

Additionally, Info6-P indicated how this sort of content and the way it was delivered aided in implementing the training tasks. Several participants (Info4-P, Info5-F, Info6-P, Info7-W, Info8-W, Info10-P, Info11-P, and Info14-P) expressed their enthusiasm and engagement for the training applicability.

Info14-P further reported that she is sufficiently experienced and bright to extract important strategies from a training session. She stated that "…the training content begins with the theoretical part and then directly the practical applications to consolidate the information."

According to Info5-F, the exercises and material activities were beneficial to sustain learning. The present study found that content consideration is critical, with participants expressing a significant preference for relevant materials.

Another sub-theme developed from the interviews on the exercises and case studies in the workplace task applications was the emphasis of the training content. Irrespective of the school grade, the trainees considered a comprehensive view of mathematics teachers training desirable to a programme explicitly provided for one class. The benefit of knowing professional standards for Omani teachers is another sub-theme developed from the interviews. The standards include the teacher's professional attributes, knowledge, understanding, and skills.

Talking about the input challenges in the mathematics teachers training, several participants indicated that the compulsory training tasks required to be implemented at school are many and worrying. Info5-F also expressed his lack of conviction in the usefulness of action research tasks in his teaching practices. In his view, this particular task is theoretical and academic and does not serve him in developing his performance. Therefore, he did not complete this task, which was the main reason for failing the programme.

Furthermore, the interview with Info10-P revealed that some trainees had insufficient knowledge of research skills, consistent with the finding of AlOmairi (2021). Several participants also indicated that the compulsory action research task hinders joining the programme because they lack research interest.

Moreover, Info14-P made it clear that there was an insufficient explanation of the training content's action research task. Therefore, those who were not interested in scientific research did not have the desire to complete it. Among the subthemes extracted from the interviews were that four of the interviewees who passed the programme expressed their unwillingness to conduct action research, which reinforces what was previously indicated that the main reason for trainees to fail was their failure to accomplish this task. As for the rest of the required training tasks that are directly related to teaching mathematics, all study participants were satisfied with them because the tasks had clearly enhanced their teaching performance.

Online training challenges are one of the issues extracted from the interviews. Online training is the second component of the mathematics teachers training programme. Several interviewees (Info4-P, Info5-F, Info11-P, Info14-P, and Info15-W) revealed that this component is the weakest and has the least impact of the three training components (face-to-face training, online training, and the workplace task applications).

"In my opinion, online training did not achieve its goal, unlike face-to-face training and the application of workplace tasks."

(Info14-P)

Similarly, Info15-W said that most of the training content is theoretical, and the training tasks associated with it are tasks that are not suitable for adult learning and are often similar to the assignments given to school students. Second, Info11-P and Info15-W mentioned that the time allotted for handing in the online training tasks was limited.

Info14-P further stated that most online training content is theoretical, unlike the training programme's two components (face-to-face and workplace task applications). Since online training is an integral part of the training programme, it should theoretically enhance the content with educational applications to increase the quality of the training programme. However, the online training seemed not to receive a favourable perception because there was a lack of educational applications for teaching mathematics in the online training content, as indicated by Info9-P, Info11-P, Info13-P, Info15-W. Despite the limitation, most interviewees mentioned that this training programme's positive outcome is using technology in teaching mathematics when applying workplace tasks.

Furthermore, Info4-P stated that there was an imbalance between the content of the four training modules. In her view, there was an intensity in the training content in the first year (first and second module) compared to the second year (third and fourth module). None of the interviewees agreed with her evaluation except Info13-P, who implicitly indicated a repetition in the training content in the second year.

4.5.3 Training facilities

SIPTT provides various services, such as accommodation, transportation, food, library, and laptops devices, in addition to the typical training facilities. Info10-P and

Info15-W acknowledged these services, which they perceived as enhancing the quality of the programme.

> "Face-to-face training is excellent in terms of preparing the training rooms. The aids are available… we found the training rooms arranged and equipped."

(Info15-W)

> "The other training advantage is the training rooms that are equipped with specific training facilities. Also, the training rooms are comfortable and well-prepared."

(Info11-P)

The majority of the study participants perceived that the quality of the SIPTT training environment/ training rooms facilitated their learning, particularly training aids.

4.5.4 Trainer competencies

All participants indicated that they valued trainers with practical expertise in teaching mathematics because they had gained competence by performing work that is considered superior to just knowing the subject matter. Most of the participants also expressed a preference for inside trainers since they understand the teachers' needs. They also indicated that internal participation is preferred because the training was designed to be institutionally Specialised in the MOE setting.

Info10-P emphasised the importance of having an experienced mathematics instructor to lead the course, "… The programme exceeded my expectations. One of the reasons is the presence of highly qualified trainers of the same speciality…". He

claimed that learning from experience, from someone who has done the work, is preferable to studying strategies and ideas in isolation.

The extracts in the next sub-sections demonstrate that all participants agreed that an instructor with practical expertise is preferable. Furthermore, according to Info14-P, this improved the instructor's perceived additional good characteristics:

"The trainer was outstanding. He has the necessary scientific knowledge and skills... the trainer excellently explained each topic and managed the programme time properly. His character was inspiring".

(Info14-P)

Info14-P referred to practical experience in playing a critical part in the trainer's competences rather than merely informed teaching (for instance, having the theoretical knowledge but never implemented). Several participants supported the assertions (e.g., Info10-P, Info11-P, Info14-P, Info8-W, and Info15-W). They stressed that sharing experience plays a vital role in forming the trainer's competencies which, in order, forms the quality of the subject of mathematics teachers training to the participants.

4.5.5 Trainee characteristics

The present study revealed many variables surrounding the pre-training attitude (e.g., participants' motivation to learn and their expectations). Additionally, delivery, outcomes during and post-training attitude, and learning style appeared to play a role in the participants' perception of training quality. Since the trainees seemed to be of

the same age group, experience, and educational environment, they held a similar opinion about the training quality.

Openness and the need for change were found among the factors that helped the participants succeed in the training process. These characteristics allowed them to apply the new knowledge in the environment because they believed in the importance and usefulness of change, as expressed by Info14-P. It is evident from past studies that individuals open to experience respond better to learning situations.

> "…our need for a change in teaching methods. The teaching strategies that we studied in the college are theoretical. When we saw new practical teaching methods applied by previous trainees, we joined the program to change our routine teaching practices."
>
> (Info11-P)

> "…I want to change the teaching methods and remember the basis of teaching knowledge and skills. I felt a necessity to join the program to develop professional behaviours, assess student learning, etc. I think, my implementation of some strategies is incorrect."
>
> (Info14-P)

Furthermore, the trainee's self-motivation is one of the main factors supporting the success and quality of training, especially in such a non-compulsory training programme that could enhance personal confidence.

Another point extracted from interviews that self-efficacy was enriched due to their updated teaching practices and trained skills. Many interviewees highlighted self-efficacy as one of the utmost important training outcomes because it increases their confidence. This outcome is especially relevant for this research because all present training evaluation frameworks focus on evaluating the learning that occurred due to the face-to-face session. However, the findings of this study suggest that less apparent

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components of mathematics teacher training, such as greater confidence and reduced

anxiety, might have a significant influence on how the participants judged quality.

Table 4.3 concludes the main findings of the key strengths and weaknesses in the input

theme.

Table 4.3 *Input Quality of Mathematics Teachers Training Programme at the SIPTT.*

1st Order Themes		2nd Order Themes	
		Strengths	**Weaknesses**
Input	Training design	SIPTT training programme was designed practically unlike governorate training.	SIPTT training design was difficult and different from other training programmes in MOE.
		The training environment at SIPTT motivated trainees to join.	The programme requirements were difficult.
		The period of training programme strengthened knowledge and skills.	
	Training content.	Best international teaching models enriched the content.	Compulsory workplace tasks was concerning.
		The content was practically compatible with mathematics teaching practices.	Other trainees complained about action research task.
		Training content combined theory and practice.	Insufficient explanation of the applications and websites.
		Training materials contained practical guideline.	Online training was theoretical.
		Training activities attracted trainees.	Imbalance in the training content of the four modules.
		Understanding professional standards for Omani teachers.	
	Training facilities	SIPTT provided good training services.	

| | 2nd Order Themes | |
	Strengths	Weaknesses
Trainer competencies	Training aids were helpful. Training room was equipped and well prepared. The trainer was creative and highly qualified. The trainer was outstanding and inspiring.	Sometimes, the trainer did not provide proper guidance.
Trainee characteristics	Openness to change. Trainees were highly motivated towards the programme. The trainee is aware of keeping updated in his professional practices. Self-efficacy as a skilled teacher was boosted by the programme	Trainees' lack of research interests.

4.6 Process

Process keeps track of the steps of training implementation. It serves as a continuous check on the execution of the training. From the participants' perspective, evaluating the quality of mathematics teachers training process revealed two sub-themes: training delivery and trainer follow-up and feedback.

4.6.1 Training delivery

In participants' answers, the trainees indicated the need for mathematics teachers training to deliver an applicable skillset. Many trainees stated on the quality of linking the mathematics teachers training to three different components in each module (face-to-face training, online training, and workplace task applications). The logic behind such a training design is combining two delivery approaches, i.e., theory and practice

(as discussed in section 4.5.1). As the training course was aimed to provide a skillset transferable to a school workplace and mathematics subject, in particular, several participants valued the delivery style of the training programme.

The trainees agreed that quality is found in the applicability rather than the complexity of the subjects.

The key point that emerged in this research was whether mathematics teachers training should be theoretically based or practice-led. The trainees were consistently in favour of practicality, irrespective of the setting or facilitators. This was mainly because of their present position and career ambitions.

Info5-P strongly made interpersonal communication point: "One of the things that I liked about training was the face-to-face interaction of trainees in the training room."

As a result, the study participants considered that the face-to-face component in mathematics teachers training was the best among other training components, as mentioned by Info5-F, Info11-P, and Info14-P. It was not surprising when Info4-P, Info12-F, and Info14-P lamented the technical problems during the online training. As a result, according to Info4-P and Info14-P, trainee participation was weak and discouraging; they did not exchange views and discuss much, unlike in the face-to-face training.

Furthermore, the personality of the trainer was indirectly acknowledged through interviewees statements about training method, class management and delivery style. Info14-P commented: "Frankly, I was impressed with his presentation style, providing information, and encouraging the trainees".

Furthermore, numerous participants alluded to being impacted by the trainers' personality and addressed obviously by Info14-P: "Honestly, the trainer's delivery

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style encouraged me to proceed with the training programme. If I were with another trainer, I would hesitate to complete the programme". The positive acknowledgement of the participants suggests that they expected to benefit from the training programme because of the way the trainers had delivered the material. The effect of delivery methods on training quality was reported elsewhere (Badlishah et al., 2019).

4.6.2 Trainer follow-up and feedback

Feedback is a powerful tool in effective training. The second point in the process that participants highlighted was trainers' support and follow-up. It varies according to the components of the mathematics teachers training at SIPTT. Several participants (e.g., Info9-P, Info10-P, Info11-P, and Info14-P) indicated that the direct support and follow-up during face-to-face training motivated them to accomplish classroom activities. In contrast, they reported that they received less support from the trainers during online sessions, which could be due to online training challenges, as indicated earlier. Third, following up with each individual trainee in applying work tasks in the work environment requires a tremendous effort.

> "Continuous communication with the trainer, providing support and assistance during the implementation of the training tasks in the work environment and discussing the workplace's challenges… I did not have sufficient experience in conducting action research. However, I overcame all that with the trainer's help."
>
> (Info10-P)

Similarly, Info14-P appreciated that "…the trainer benefited us greatly. His encouragement and continuous support helped us to overcome the difficulties. He often replies to the e-mail or answers the phone."

In any training programme, interactive activities are mostly carried out to keep trainees busy and allow them and the trainer to use real-time feedback. Despite the mathematics teachers training period at the SIPTT, which extends to two years, most participants expressed their admiration for the trainer's follow-up and support. Table 4.4 summaries the main findings of the key strengths and weaknesses in the process theme.

Table 4.4 *Process Quality of Mathematics Teachers Training Programme at the SIPTT.*

1st Order Themes		2nd Order Themes	
		Strengths	**Weaknesses**
Process	Training delivery	The trainer's presentation style was impressive.	Discussion in online training was not beneficial.
			Lack of trainee participation in online training.
		Trainer attracted trainees' attention.	Limited time for online training tasks.
		Interaction between trainer and trainees in face-to-face training was excellent.	Theoretical online training tasks.
			Technical problems in online training.
	Trainer's follow up and feedback	Trainer was supportive in training tasks.	-
		Trainer continuously communicated and followed up with trainees.	

4.7 Outcomes

The interviewees stated a large number of positive results of the training programme. Expectedly, this theme took the largest part of the strengths of the training programme, unlike other themes. Many benefits mentioned by the trainees reflected the quality elements in the programme. From the interviews, four sub-themes were extracted (a) trainee satisfaction, (b) teacher skills, (c) teacher productivity, and (d) research skills.

4.7.1 Trainee satisfaction

Many training evaluation surveys ask trainees to respond to open-ended questions and provide quantitative ratings of reaction items. This research is considered an important first step in gaining a deeper understanding of trainees commenting on mathematics teachers training evaluation by providing empirical evidence that can inform qualitative reactions.

This study found that the positive trainees' reactions in the interviews support previous quantitative findings of mathematics teachers training (see Table 1.4). Specifically, Info4-P, Info6-P, Info9-P, Info11-P, Info13-P, and Info5-F explicitly stated that the programme was a valuable experience. Likewise, Info4-P, Info14-P and Info15-W expressed their satisfaction with the programme as it had met meeting their expectation.

Consistently, Info8-W asserted that the SIPTT mathematics teachers training programme was a positive experience because of the design. Although there were short-term training programmes for mathematics teachers in the educational governorates before the SIPTT establishment, most of them did not contain practical tasks in the workplace. Therefore, the trainees felt that mathematics teachers' training structure at the SIPTT (see Figure 1.1) was useful because such a design was absent in other training programmes in the educational governates.

Despite some trainees' poor training performance (see Table 1.3), Info5-F, for instance, recommended other mathematics teachers to join the programme because, according to Info12-F, "this programme is one of the best training programmes in MOE. It helps the teacher excellently."

The study findings indicated that the mathematics teacher training at the SIPTT given to the trainees is an important factor in increasing training transfer (Kodwani & Prashar, 2021) which might enhance the emotional commitment to complete this voluntary programme (two-year).

4.7.2 Teacher skillset

This study found various enhanced skillsets as a positive training outcome extracted from the programme's strengths, including increased self-reflection skill (this skill is already included in the training content, and it is one of the objectives of the training programme). Info4-P said:

"…. how I can develop my skills in the learning process through reflections, where the teacher stands in the position of improvement and development of his skills through these reflections on educational practices".

The self-reflection skill is one of the skills targeted by the training programme because it is purported to develop the teachers' critical thinking. Similarly, Info4-P, Info7-W, and Info14-P pointed out that the training programme helped them to self-evaluate as the programme enabled them to identify their strengths and weaknesses in their daily work practice. According to Info14-P:

"The programme revealed my strengths and weaknesses. I knew exactly where the needs are in my career – what are the things that I have the strength in and can be further developed."

Self-evaluation skill appears when applying training tasks in the school because the training and actual work settings are different. Equally, Info15-W mentioned that mathematics teacher training enhanced self-learning skills because they had to read many resources to accomplish the training tasks. Additionally, Info10-P acknowledged that the programme had implicitly empowered his self-appreciation.

"I had conducted practical workshops on implementing the teaching strategies that we had previously trained on in the programme. I considered it an outstanding achievement for me."

(Info10-P)

Unsurprisingly, the desire to be offered with practical tools was expressed. Two participants (Info7-W and Info8-W) stated that the theoretical knowledge was helpful but insufficient if not applied to their day-to-day job. While there was a recognised advantage to comprehending some of the subject area's theory, this benefit was realised only through practical application at work. Info5-F made a related point that his main route to understanding was through learning by doing or application. Info12-F made a similar comment by pointing out that appreciating mathematics teachers' role makes his job more manageable.

Moreover, Info4-P and Info10-P indicated that they became mentors to their non-trained colleagues when applying some teaching strategies. Their new role illustrates the positive impact of applying workplace tasks and expanding their effect on their peers. It also demonstrates the quality of training tasks and the compatibility with teaching practices that boost the culture of professional learning communities.

Support was the only influencing element mentioned directly in the earlier sections. Many participants shared tales about how they used what they learned in the workplace, how it helped them communicate better, and how it boosted their self-confidence. Instead of including many comparable snippets, the following text summarises many topics raised by the other respondents. Info7, Info10, Info13, and Info14 described the impact of the training on them in that they could use the skills taught and successfully communicate with their peers and principals about their work outcomes. Furthermore, two trainees (Info5-F and Info8-W) stated that the mathematics teachers training programme effectively enriched the skill of classroom management.

Additionally, Info6-P stated that the "training programme facilitates us to create educational aids on the mathematics teachers training outcomes. We are trained to create exciting and inexpensive educational aids innovatively." Info10-P and Info15-W also hinted the same. Teaching aids are tools used to assist teachers to manage their learning environments and activities productively. The info6-P statement reflects a positive result of the programme, which gives a distinct impression to others of the consistency of the training programme with the curriculum. It facilitates the possibility of exploiting the resources available in the school to produce new educational aids. Info8-W, Info10-P, Info13-P, Info14-P, and Info15-W also explained the positive results related to the use of technology in teaching mathematics.

Extending this idea even further, all trainees explained how they benefited from the training programme in developing methods of teaching mathematics, which was the core aim of the training programme. All participants were looking forward to the new mathematics teaching strategies to help them deliver their courses better.

Likewise, Info4-P explicitly mentioned the positive influence of the mathematics training programme on her performance "I saw the programme's impact and how my colleague improved…. I felt that this training programme focused in-depth on the mathematics subject itself, which is better because it serves the learning environment's educational process". Other participants (Info5-F, Info6-P, Info9-W, and Info12-F) also claimed that the programme had a great impact on their performance, particularly in teaching mathematics. "When I returned from the Specialised Institute, I tried these strategies in the classroom. I felt a big difference. I noticed a better level and a big difference from my previous performance" (Info6-P). If the trainees perceive that the training programme enables them to perform their task effectively, they will try to get maximum knowledge. Whatever knowledge and skills they acquire, they will try to use it in their job.

4.7.3 Teacher productivity

Productivity in education centres is mainly on the teachers' output in increasing students' learning achievement through effective classroom interaction and management (Emunemu & Isuku, 2012).

Effective professional development changes teachers' knowledge and practices and improves student learning outcomes. The quality of the training programme that has shown an impact on student achievement is focused on the content that teachers teach. Content-focused professional development generally treats discipline-specific curricula such as mathematics. It is most often job-embedded, meaning the quality of mathematics teachers training is situated in teachers' classrooms with their students.

In support of student performance arguments, this study has much evidence. First, Info5-F and Info14-P talked about the enhancement of the teacher-student

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relationship. The improvement of such relationship increase a positive attitude of students towards the mathematics class.

Secondly, Info4-P, Info5-F, Info6-P, Info10-P, and Info11-P revealed increasing student motivation to learn.

"I observed improvement in students' achievement, for example, in terms of comprehension in the class and the motivation to learn."

(Info6-P)

"I noticed students' attractiveness increased for the subject due to our application of entertaining teaching strategies. Hence, the mathematics subject turned from a purely rigid subject into an interesting subject for students."

(Info5-F)

"We noticed an increase in students' motivation to participate. As you know, mathematics is a purely scientific subject. After we applied those strategies, the subject became more attractive for students and increased their motivation to learn."

(Info11-P)

Thirdly, Info5-F, Info6-P, and Info12-F asserted the student participation improved in the classroom. The interviews suggest that the teaching strategies were applied in the classroom significantly motivated students to participate in the classroom and learn.

"Active learning strategies make the student constantly participating in the class and attracted to learning."

(Info6-P)

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"The students also benefited from active learning. Students' participation in the classroom increased due to teachers' application of such strategies."

(Info12-F)

Fourthly, Info5-F, Info6-P, Info8-W, Info9-P, Info10-P, and Info12-F stated that the mathematics teachers training programme helped them increase student achievement.

"I mastered many modern teaching methods such as teaching strategies using technology in the classroom. It had a significant impact on the students' achievement."

(Info8-W)

"I applied modern teaching strategies, for example, active learning strategy, flipped classroom strategy, and project learning. It helps me raise the achievement level of students in mathematics subject."

(Info9-P)

"Students insisted on using strategies that we trained on, such as play-learning and cooperative learning—students in some lessons divided into groups before the teacher arrives in the classroom. I have noticed a gradual improvement in student achievement."

(Info10-P)

It is evident from the results of this study that the application of the mathematics teaching strategies positively raised students' learning achievement.

4.7.4 Research skills

Additional analysis of interviews revealed that the mathematics teachers training programme had improved the participants' research skills. In this regard, Info10-P stated:

"The programme helped develop the teacher's skills. For example, research skill, the trainee was able to identify the problem he faces in the school and analyse it to find a solution".

Info9-P, Info11-P, Info14-P, and Info15-W also shared the same perspective. Action research is a requirement to pass the training programme. They appreciate the importance of including such scientific research in developing their performance. However, many participants complained about the action research task they considered a challenge, as discussed earlier. Table 4.4 summaries the main findings of the key strengths and weaknesses in the outcomes theme.

Table 4.5 *Outcomes Quality of Mathematics Teachers Training Programme at the SIPTT.*

1st Order Themes		2nd Order Theme	
		Strengths	**Weaknesses**
Outcomes	Trainees' satisfaction	The programme fulfilled trainee's expectation. The programme was valuable experience. Trainees recommended other teachers to join the programme. The programme was interesting. The programme enhanced self-reflection.	Failing, withdrawing, or not registering in the programme due to: - Compulsory action research task. - Increasing school workload because of the training programme. - Inappropriate timing for face-to-face training. - Vague value of training certificate on teacher's career path.
	Teacher skillset.	The programme helped trainees' self-evaluation.	

| 1st Order Themes | 2nd Order Theme | |
	Strengths	Weaknesses
	The programme increased self-learning skills.	
	The programme boosted self-appreciation.	
	The programme improved trainee teachers' performance.	
	The programme developed classroom management skills.	
	The programme learned trainees how to create inexpensive and innovative educational aids.	
	The programme gained trainees new assessment strategies for student learning.	
Teacher productivity	The programme enhanced teacher-student relationships.	
	The programme increased student participation.	
	The programme increased student motivation to learn.	
	The programme helped increase student achievement.	
Research skills	The programme developed research skills.	

4.8 Summary

This chapter begun with the participants' profile and their demographic features. Based on the study findings, this chapter outlined five themes (context, administration, input, process, and outcomes) and fourteen sub-themes that consists key quality indicators of mathematics teachers training at the SIPTT. The strengths and weaknesses in each theme are presented at the end of theme section.

Next chapter will discuss the key strengths and weaknesses of the training programme based on the research findings. It linked to previous literature related and ends by a proposed training evaluation model.

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This section discusses the key findings based on the interviews conducted with the participants of the mathematics teacher training at the SIPTT. As detailed in the previous chapter, the key findings of the research provide a conceptual understanding and practical suggestions on mathematics teacher recruitment and their non-mandatory training in Oman generally and in the SIPTT context in particular. The chapter concludes by presenting a proposed framework for determining the quality of training at the SIPTT in Oman.

The study findings showed that participants hold different perspectives about the mathematics teachers' training quality at SIPTT. In the previous chapter, the findings are organised into five themes: (a) context, (b) administration, (c) input, (d) process, and (e) outcome. In this chapter the strengths, weaknesses associated with each theme are discussed.

5.2 Strengths of the training programme

This section discusses the strengths of the programme based on the themes identified in previous chapter to answer the first research question. The *context* theme contains two sub-themes (supportive school environment and professional learning communities) as the key indicators of the quality of mathematics teachers training.

The findings highlight the importance of organisations in providing appropriate motivational and environmental supports for training transfer. The necessity of managing return to work experiences, feedback opportunities, and formal recording

of training experiences was revealed through this research. The school principal's support, supervisor's support, peer support, technical assistance, and the ability to utilise the knowledge gained from the training were the considerations investigated in the present study (Na-Nan et al., 2017).

The school principals were found to play an indirect role in enhancing the quality of the training programme as they were supportive of the trainees attending the training programme. The findings allude to a close partnership between the trainee and the principal (Matsumura et al., 2010). The principals should implement whole-school initiatives and identify the needs of the teachers (Charner & Medrich, 2017). They should collaborate with mathematics teachers' training conducted by the SIPTT to spread a shared culture of the necessity of being an effective contributor in participating in the MOE development plan. Such voluntary training supports trainees while completing the training tasks and frequently communicates with the teachers about the importance of professional development opportunities (Ali et al., 2018). The principals must also note what and why changes are being asked of the teachers since the former greatly influences the teachers' professional development (Bredeson, 2000). Vikraman et al. (2017) concluded that the principal's understanding, influence, and support are important factors to boost the quality of the training programme. Positive communication between trainers and principals before, during, and after training was recognized with the increased usage (Almannie, 2015). School principals can be the key to closing the gap between teachers and trainers by providing a supportive work environment and allocate sufficient time and resources (Knight, 2009). Increased activation in the school administration in this study corroborates the earlier findings in Oman (e.g., AlOmairi & ALKiyumi, 2020; Al-Shabibi, 2013).

The study also found that the trainees received support from their fellow teachers, whether these teachers were former trainees at the SIPTT or not, indicating the former trainees' conviction of the usefulness of the training programme. The literature highlights that peer support encourages trainees to apply the new skills and transfer the training (Bhatti et al., 2013; Blanchard & Thacker, 2013; Martins et al., 2019). The findings are consistent with the importance of workplace support in motivating training participation (Matsumura et al., 2010). Peer support could take the form of discussion, advice, and/or the sharing of experiences that develop participants' expertise and skills (Richter & Kauffeld, 2020). Peer support builds an atmosphere where experiences and knowledge are freely exchanged and shared between employees (Grossman & Salas, 2011). Hence, peer support is considered as a significant element for effective training (Bhatti et al., 2013; Martins et al., 2019).

Furthermore, the interviewees valued the compatibility of the mathematics teachers training programme offered by the SIPTT with their training needs to develop their teaching skills in the school environment which enhanced peer support as well. Through peer support and encouragement, the interviewees indicated that the programme had helped them engage with the professional learning community, another indication of the quality aspects of the training programme.

Second sub-theme of context is p*rofessional learning communities.* A mutual goal formulation, conjunctive values, a culture of reflective dialogue about one's own teaching and students' learning processes, as well as the incorporation of external expertise as a stimulant for development, are all significant characteristics of these types of professional learning communities (DuFour, 2004). All these structural features are essential for effective continuing teacher education (Höhnle et al., 2016).

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There are positive effects of professional communities that operate beyond the school level (Darling-Hammond et al., 2017).

Such a constructivist approach as it enables the learning process (Brooks & Brooks, 1993). Professional development designs that attend to the trainees' learning may use what they refer to as the 'reciprocal processes of constructivist learning' (Hord, 2009, p. 41). By this, learning that is mutual and interactive, investing in the growth of all participants. Constructivism recognises learning as the process of making sense of information and experiences. Constructive learning requires an environment where learners work collegially and are situated in authentic activities and contexts (Vygotsky, 1980). Lund (2020) stated that professional learning communities are of great importance concerning in-service teacher training.

The professional learning communities facilitate trainees to exchange their knowledge and skills (Darling-Hammond et al., 2017; DuFour, 2004; Song & Choi, 2017). Networking with the professional societies for mathematics teachers in Omani schools is one of the key objectives of establishing this programme. Teachers' skills could be improved through such a network, reflecting positively on student performance (Al-Jabri et al., 2018). In this regard, networking with professional communities is an important reinforcement for mathematics teachers. A teachers' capacity for creating meaningful and supportive relationships is an essential element in professional practices (Song & Choi, 2017). These can then affect the individuals' behaviours within the group. This will influence how they consider the quality of the training events (Cansoy & Parlar, 2017; Svendsen, 2016; Vangrieken et al., 2017).

The *administration* theme consists of the sub-themes of policies and procedures. The study results showed that the administrative aspects related to the training programme focus on two components: the administrative circular to the schools and

the one-day release from the school. Both components were perceived to constitute the key strengths and hence quality of the training programme as these policies encouraged and motivated them to attend. Educational training programmes swim in a stream of state and national policies and local mandates and regulations. Standards and accountability systems, incentive systems, school schedules and calendars, professional development and recertification procedures, time for teacher learning, and other policies at all levels strongly influence professional development (Loucks-Horsley et al., 2010).

Institutional procedures comprise all organisational conditions for continuing teacher education in all facets. Relevant features of effective training activities (as the case of mathematics teachers training) are (a) voluntary participation, (b) the possibility of an absent leave from teaching for one week for face-to-face training, and (c) one-day release from school duties. These conditions are viewed as influencers of the teachers' volitional and motivational attitudes toward training activities (Schellenbach-Zell, R¨urup, Fussangel & Gr¨asel 2008, as cited in Höhnle et al., 2016).

The MOE has developed some administrative procedures to boost the transfer of the training to the trainees' workplace, such as releasing them for one day weekly from their school and work duties. The key aim is to motivate trainees to perform the required training tasks and eliminating clashes between work and training tasks. Organisational support (in this case, SIPTT) can either promote or hinder training application to the tasks (Homklin et al., 2014).

The *input* quality indicators of mathematics teachers training that emerged were related to training design, content, facilities, trainer competencies, and trainee characteristics. Compared to previous training programmes, the programme design

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was perceived to be unique as it contained three training components (face-to-face, online training, and the application of workplace tasks) where trainees were exposed to theoretical and applied knowledge and encouraged to transfer the new skills at work. It goes without saying that any evaluation that is not integrated into the training design process will not produce the desired results (Goluguri, 2015).

The participants positively perceived the design of SIPTT training programmes. It is unlike the previous programmes that conducted in educational governorates which had limited benefits (Al Lamki, 2009; MOE & World Bank, 2012). It is worth noting that the training programmes in the educational governorates are unlike the SIPTT design. They are more like workshops (Al-Jabri et al., 2018) and do not extend for a long period. In contrast, the SIPTT training programmes consist of four modules to be completed within two years. Each module contains three components or delivery methods.

According to participants' view, the face-to-face training (first component) is the best one in the programme. It enhances the exchange of information and experiences and motivates the trainees. The interaction enhances trainees' confidence in building professional learning communities mentioned earlier. The most prevalent mode of teaching remains face-to-face classroom instruction (Tews & Noe, 2019). This study findings contrasts to the study of Poelman et al. (2021) that stated Face-to-face training adds no value to the teachers entirely online training.

Furthermore, the participants indicated that they benefited from sources and materials included in online training (second component), which helped them prepare the content of the workshop.

The quality of face-to-face and online training could not confirm the acquisition of new knowledge, skills, and attitudes, and their transferability back in schools. Thus, the third component of the mathematics teachers training (workplace tasks application) weighs half the training programme. This component is responsible for changing the teachers' attitudes and developing their skills by giving them training tasks that must be applied in the work environment and submitted to the trainer to be evaluated. The transfer of learning from the course to the workplace must be a key issue for organisations (Cornford, 2002). Successful application of new skills, knowledge, and abilities learned through a training programme at the workplace has been the key predictor of the quality of individual-level training (Bell et al., 2017; Burke & Hutchins 2007; Grossman & Salas, 2011).

The key aim is to motivate trainees to perform the required training tasks and eliminating clashes between work and training tasks. Besides, the two-year period of the programme at the SIPTT is among its advantage that consolidate the training applications in the workplace. Similarly, Alsaleh (2020) recommended that teachers need more and longer-term training programs on trained skills as well as longitudinal research investigating such skills.

Training design is an important factor in training quality (Phillips & Bullock, 2018; Tabatabaei et al., 2021). Research in training quality concludes that learning success depends on the length of the programme (Salas et al., 2000). Furthermore, McNamara (2019) highlighted the importance of selecting training activities that enhance the teaching and learning process, such as face-to-face sessions, computer-based training, interactive, self-directed, or multimedia-inspired classes. Enhancing training course programmes using e-learning and blended learning methods in order

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to improve the development of country's educational system and keep it on level with those of developed countries (Burr, 2018).

According to constructivist theory, a learner generates value and information through exchanging experiences with other learners, and a face-to-face professional training process provides these opportunities (Miliszewska, 2007; Sargeant, Curran, Allen, Jarvis-Selinger, & Kendall, 2006).

Training quality, as showed earlier in the literature, is determined by the acquisition of new skills and knowledge (face-to-face and online training components in this mathematics teachers training) and the transferability of those skills back in the workplace (workplace task applications) (Bell et al. 2017; Burke & Hutchins 2007; Grossman & Salas, 2011).

By selecting the most suitable media and materials, trainees could develop their skills, knowledge, and attitude toward the training programme by checking the accuracy of the contents and the logical sequence of materials to be presented. In response to the review that content should be closely related to work roles (Grossman & Salas, 2011), the trainees reported that training activities aided and embedded teaching strategies. This supports the perception that mathematics teachers training offers one of the main transferable skills in a workplace (Pokharel, 2018).

These perspectives seemed to reaffirm the participants' desire for mathematics teacher training at the SIPTT to provide actual, transferable abilities that can be practically used during the course. It demonstrates that practicality is critical for creating enthusiasm and interest in a mathematics subject classroom (Khales, 2016; Trouba, 2009). Further, the statements support Alamri et al. (2018), who claimed that many present academic courses lack a realistic environment to reflect on learning, and

for mathematics instruction, a substantial practical component is required (Khales, 2016). Participants concurred with the literature's argument of the need for increased synergy between practitioners and academia (Giangreco et al., 2010).

Participants emphasised the importance they placed on discussing methods and having the chance to practice them in training. Even aspects that may be classified as education, in their opinion, are only relevant because of their direct connection to the workplace. This reflects Trouba's (2009) call for a balance between theory and practice in mathematics training research and learning, where mathematics training research and learning should be a reflection and action.

Interviewees also specify the professional characteristics a teacher is expected to maintain and build on throughout his/her teaching career. Standards will support teachers in identifying their professional development needs and support them in identifying ways to broaden their expertise within their current career stages (MOE & World Bank, 2012).

This study also found that the content and materials used in the mathematics teachers training were critical quality indicators. The content of training, among other factors, has been proven to have an effect on the quality of training (Mohanty et al., 2019; Tabatabaei et al., 2021). The training contents should be easily comprehensible and appropriate to the trainees, and they should be congruent with the intended course, learning objectives, and outcomes (Falola et al., 2014). El Hajjar and Alkhanaizi (2018) found a significant positive linear correlation between relatedness of training material and training quality. In other words, training content that is relevant to daily tasks will have a beneficial effect on skill and knowledge transfer on the job. The

perceived utility of training material has an effect on trainees' reaction, learning, and behaviour (Nikandrou et al., 2009).

Facilities include training equipment, site design, good lighting, hardware environment, software environment for participation of trainees, and classroom climate. They may also include auditoriums, typically large rooms, medium-sized instruction rooms for various purposes, audio / visual rooms, computer training rooms and laboratories, and other training resources. A good training facility must have a flexible and technologically advanced learning environment. Training facilities must have high-quality indoor environments that can positively influence the trainees' task performance and attention spans.

The majority of the study participants perceived that the quality of the SIPTT training environment/ training rooms facilitated their learning, particularly training aids. This study finding is consistent with many previous literature (Akther & Rahman, 2021; Williams, 2008; Tabatabaei et al., 2021). Likewise, Alshykairi (2020) investigated the perception of the trainee supervisors at SIPTT and found a similar result.

The trainers were also perceived to be qualified, knowledgeable, and Specialised, indicating the quality of this specific training. All participants indicated that they valued trainers with practical expertise in teaching mathematics because they had gained competence by performing work that is considered superior to just knowing the subject matter. The research suggests that earning the participants' confidence and trust through a show of experience is seen favourably by them. The finding is consistent with the arguments of Khales (2016) and Chukwu (2016). Participants assertion validates the belief of many practitioners that prior expertise is required to undertake training in this field (Teplitz, 2001).

The ability to answer questions using stories and instances of experience, according to participants, increased the instructor's credibility as a subject matter expert. Rather than reciting materials in a textbook, it provided meaning and depth to the subject, and the tales and scenarios brought colour.

Although the trainer in this study's training course had practical experience and drew on real-life events to improve the learning experience, questions were raised of whether practical expertise is truly required. Perhaps just providing the perception of a large portfolio of job experience is enough to make a trainer credible. The primary point of discussion among the participants was that the instructor's practical expertise was critical for this sort of training. This is inextricably linked to the arguments presented in that the facilitator should be suited to the material, and it emphasises the need of having contextual expertise in the field of training.

According to the literature, the practical experience level required of a trainer in a subject to deliver valuable training is a divisive issue: academics claim that learning is finest provided by those who have thoroughly studied the subject. In contrast, practitioners argue that practical experience is essential for such a 'hands-on' subject, such as mathematics. This issue was unravelled in the interview and represented a theme of tying training quality to competent trainers. Perceived trainers' competence emerged as a crucial feature in shaping individual competences (Hassi et al., 2011). This perceived quality of topic matter, in order, recommends value to the participants (Chukwu, 2016).

The term "trainee characteristics" was used to describe the study's participants' qualities, behaviours, and attributes. In this study, a question was raised about whether personal characteristics affect the participants' assessment of mathematics teacher

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training. Table 5.1 summarises relevant factors indicated in the literature to influence

training assessment (Cheng & Ho, 2001; Holton, 2005; Noe & Schmitt, 1986; Russ-

Eft & Preskill, 2001; Warr & Bunce, 1995).

Table 5.1 *Summary of Trainees' Characteristics Factors*

Factors	Description
Demographic	Personal information about participant (including age, educational qualifications).
Attitude	Subdivided into three areas: pre-training (including expectations, motivation to learn); during training (enjoyment); post-training (including self-efficacy, openness to change).
Experience	Prior experience and work history of the participant.
Application and transfer	Motivation and personal capacity to transfer the learning.
Learning style	Ability and self-efficacy to learn new skills.
Perceived support	Opportunity to apply learning and favourability of work environment to allow it.

The abovementioned characteristics were utilised to guide the interview coding.

However, relatively few quotes focused on one issue. As a result, sample participant

quotes are utilised in this section to demonstrate the influence of trainee

characteristics.

Focusing on the human side of assessment makes it simpler to accomplish when

the individual is at the centre of a qualitative training evaluation. This finding broadly

supports the work of other studies in this area linking trainee characteristics with

training quality (Holton, 2005; Newcomer et al., 2015; Tai, 2006; Velada & Caetano,

2007).

The interviewees indicated that some experience with a working environment is

necessary to properly understand the training content, supporting Mansour et al.

(2014) study, which revealed that experience significantly improved mathematics

teaching ability.

Unsurprisingly, the participants' high expectations for what the course would contain or eventually provide seemed to impact their perception of training quality. According to Torbeck (2010), pre-training anticipations and the capacity of the programmes to meet those expectations would be a vital indicator of quality for trainees. This has significant implications for assessing the quality of mathematics teacher training programmes. If each trainee has only hazy expectations from the programme that are unrelated to the learning goals set by the programme designer, assessing whether these outcomes were reached is useless.

This study found that participants tend to be more open to trying new things; therefore, they may be more prone to transfer their training (Yamkovenko & Holton, 2010). Additionally, this study revealed that trainees expressed their motivation to update their teaching practices. An individual's level of training motivation is the key determinant of training quality (Akther & Rahman, 2021; Mathieu & Martineau, 1997; Yanson & Johnson, 2016). It refers to the direction, intensity, and persistence of effort toward utilising learning in a work setting (Holton et al., 2000). Facteau et al. (1995) argued for the importance of learning transfer motivation to the extent that they argued that the more motivated the trainees are, the more likely they would reap the intended benefits from the training experience, keeping everything else constant. Therefore, it can be assumed that the more attention to training motivation is given, the more transfer will be assured (Singh, 2017). This study found that trainees were highly motivated to attend the voluntary training, which supports Mathieu et al. (1993) finding.

The study finding also highlighted self-efficacy. It is commonly considered to be a crucial element in enhanced learning (Sadler-Smith, 2006). It is described as believing in and developing self-confidence in one's abilities (Sadler-Smith, 2006). It

is described as believing in and developing self-confidence in one's abilities (Sadler-Smith, 2006). This is especially important for the instructors of mathematics, who must have the competence and confidence to use new tools and approaches in learning and maintain change beyond training. Self-efficacy is a good measure of training quality in the public sector (Yanson & Johnson, 2016). Yanson and Johnson found that utilising learning from the course makes it easier to communicate with principals and colleagues in the school environment. Similarly, Akther and Rahman (2021) stated that self-efficacy influences training quality in the banking sector.

The quality indicators of mathematics teachers training at the *process* stage comprises training delivery and trainer follow-up and feedback. Process was established to offer a basis to investigate the trainees' preferred styles of mathematics teachers training delivery. This becomes a point of emphasis in this section and subsequently in input when arguing the trainer's competencies. The process category was developed from the previous studies to discuss the different mode and levels of feature in designing mathematics teachers training programmes to know whether attendees perceive more outstanding quality in a theoretically based approach or practice-led to the topic matter.

A further debate revealed in the literature was the theoretical-based delivery. According to some, it must be implemented in order to represent the complex working environment in which organisations function (Adamu, 2014)**,** while others argued that it must emphasis on the tools experienced professionals use to increase their teaching effectiveness, irrespective of the simplicity level. There is a shortage in the existing training evaluation models that address the applicability when assessing a training course. Warr et al. (1970) discussed 'inputs' to be considered in training evaluation

but not the individual approach taken in training delivery. If, as this research shows, the delivery style of the programme has a robust bearing on the perceived quality of the training by the participants, then the mathematics teachers training evaluation should evaluate it independently.

Trainers should explicitly link materials and examples to the present work role of trainees (Grossman & Salas, 2011). The facilitator incorporates activities that promote interpersonal communication and practical application (Brooks-Harris & Stock-Ward, 1999) to enhance trainees' ability and motivate them to interact with the trainer. The facilitator's role is to encourage active participation through collaborative interaction between small groups or entire groups, engage all participants in dialogues and questions, and interpret collaborative outcomes through discussions and reflective strategies (Fogarty & Pete, 2007).

The participants of this study asserted good interaction in the face-to-face component. The study finding is consistent with Buch and Bartley (2002), who maintained that the training delivery method in a classroom is preferred to other delivery methods of training. The present result is also consistent with past studies (Arthur et al., 2003; El Hajjar & Alkhanaizi, 2018; Harris et al., 2014; Rangel et al., 2015; Towler et al., 2014; Widyaiswara et al., 2019). However, due to the different training structure among the three components, the interviewees considered the face-to-face/lecturer-led training component to reflect the most quality, which was not surprising because of the direct interaction between the trainer and the trainee. Past studies found that direct interaction increases training effectiveness (Harlen & Doubler, 2004; Miliszewska, 2007; Sargeant et al., 2006).

Moreover, the participants stated the friendly interpersonal skills of the trainer. Conducting an activity with someone who is regarded or appreciated will be perceived more favourably than conducting the same action with someone who is not as highly respected (Iglesias & Salgado, 2012). Diamantidis and Chatzoglou (2012) asserted that instructor performance has the most significant influence on interviewee perception of quality along with training.

While both dimensions indicated quality, the feedback and follow-up were particularly significant to the trainees, especially in the workplace task applications component. SIPTT intentionally designed the programme to constitute 50% of the feedback and follow-up component to apply and transfer their new skills at work effectively. This component was also found to be an important factor that encouraged trainees to take up voluntary training in subsequent modules. Feedback is often employed during mentoring and coaching but not limited to these spaces (Darling-Hammond et al., 2017). Continuous support and follow-up from the trainer are perceived as the second strong point of the mathematics teachers training programme.

The trainer's feedback is the most critical component of learning and the most significant factor in training success (Kester & Oludeyi, 2017). Consideration of adult learning principles (Kokkos, 1998 as cited in Kourkouli, 2015) seems to be of utmost importance in a teacher training course since adult learning is believed to be experiential and follows learning cycles. Theory and practice integration is another effective teacher development process since a strong theoretical background is valuable but inadequate on its own to lead to effective training. Moreover, the difference in mathematics teachers training components enforces a continuous process that employs continual monitoring of the teachers' implementation practice and

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feedback on their implementation progress and follow-up support (Kourkouli, 2015). Furthermore, training quality research has concluded that training success depends on diagnostic feedback (Salas et al., 2000; Williams, 2008).

Past studies showed that the more opportunity a trainee receives useful feedback during training, the more the skill transferability between training and the job (Ahmed et al., 2017). Wagner (1998) considered these activities critical for experiencing quality learning. Similarly, many previous studies found that follow-up and feedback are significant factors of training quality (Christina & Alpenfels, 2002; Kester & Oludeyi, 2017; Phillips & Phillips, 2002; Rothwell, 1996; Salas et al., 2000; Williams, 2008).

The most apparent finding to emerge from the interviews is the *outcomes* of the training as one of the quality indicators. Outcomes reflect trainee satisfaction, teacher skills, teacher productivity, and research skills obtained from training.

The trainees' comments on the quantitative questionnaire did not provide detailed data, unlike their answers to the qualitative questions (for instance, interview). That raises potential representativeness issues with the comments (e.g., Rogelberg & Stanton, 2007) and suggests caution should be taken until more is known about commenting, such as who makes the comments, what individual and contextual factors influence commenting, and the nature of comments made.

The participants expressed their satisfaction about this voluntary programme. Most of them vividly indicated that the programme had met their expectation in term of practical training design. Al-Jabri et al. (2018) supported this view, who stated that Omani teacher needs were not sufficiently met before the SIPTT establishment. The quality of training depends on the relevance of the training package to trainees'

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genuine needs (Chval et al., 2008). If the training programme addresses their needs, they will attain high satisfaction and grade the training delivered as very effective (Vyas, 2004). If trainees are satisfied, then training centres do deliver a better quality of training (Essaoudi & Lotfi, 2021).

Quality is a phrase used to describe a high level of customer satisfaction (mathematics trainee teachers) in relation to variables that define a certain service (SIPTT training programmes). Determining whether or not mathematics trainee teachers are satisfied is the most effective technique to gauge quality. In the field of education, the ongoing quest for ways to improve the quality of educational services has driven the scientific community to develop specific measurement methods in order to meet trainees' quality expectations (Athanasiadis & Kasimatis, 2021). The satisfaction of trainees might be a marketing tool for publicizing voluntary training programmes at the SIPTT. Therefore, that could help increase participants' number in subsequent cohorts. Besides, trainee teachers may reach a sufficient level of job satisfaction through in service training (Elban, 2021).

One of the skills targeted by the training programme is self-reflection which helps them to develop critical thinking. Continuous inquiry into one's own practise as well as reflection on what instructors learn and how to integrate it into the classroom are required for inquiry and reflection (Ramos-Rodríguez et al., 2021).

Similarly, some trainees pointed out that the training programme helped them to self-evaluate as the programme facilitated them to recognise their strengths and weaknesses in their daily schoolwork practice. Self-evaluation is an important source of evidence of teaching effectiveness (Berk, 2005).

According to the interviewees, the training programme enhanced their self-learning skills which is consistent with AlOmairi's (2021) study. Equally, Arthur et al. (2003) and Kaizer et al. (2020) stated that the most critical indicators of training

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quality are learning outcomes. Furthermore, Smith (2014) states that previous research indicates a number of crucial characteristics of quality professional development: it enhances teacher's content and pedagogical knowledge.

The interviewees were resounding in their support that mathematics teacher programmes should emphasis on teaching applicability and repeatable practices that can be directly used in a school workplace. This finding relates to the previous results that connection and a transferability to the present role of mathematics teachers was a priority for the participants. The programme should demonstrate the utility for training evaluation's application to employability development (Glerum & Judge, 2021). According to Dulo (2022) study that showed how a holistic approach to training evaluation can provide proof that an employability development programme fulfilled its goals.

Furthermore, participants stated that the mathematics teachers training programme efficiently improved the skill of classroom management, which Al-Shabibi (2013) stated as one of the challenges faced by many Omani novice teachers face. Hence, the mathematics teachers training programme partially helps overcome this issue.

Additionally, according to the interviewees, they gained how to produce educational aids as one of valuable training outcomes. The skill of production of such aids supports learning and makes life easier for the teacher – they support the professional practice of teaching.

Another sub-theme in outcome extracted from the interviews that trainees appreciated the enhancement of the use of technology in mathematics teaching. Thus, from the trainees' perspective, the training programme has achieved the planned

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objectives, which is a quality indicator in this aspect. AlOmairi (2021), who conducted a descriptive study of 686 trainees at SIPTT, found that one of the positive impacts of the training programmes is the enhanced use of technology.

The trainees noticed a positive change in their practices when teaching mathematics. This finding corresponds with Harris and Sass (2011) and Pokharel (2018), who studied prior professional development training at the middle and high school levels in the US and found a positive effect on the performance of math teachers. The study findings revealed that the participants asserted that the programme improved their teaching performance. This finding is in line with Ulla (2018) study who reported that a significant contribution of training programmes towards teachers' teaching skills. Teaching effectively, teachers need access to continuing teacher professional development (Mugarura et al., 2022).

Notably, enhancing teaching skills was a major point in outcome theme in this study. Therefore, this programme facilitated SIPTT's role that intend to develop comprehensive mechanisms and plans for training and monitoring teachers' performances (Al-Jabri et al., 2018). According to participants" view, it is positively contributing to their performance. In addition, according to this study findings, in-service teacher training inspires learners to achieve greater results. The focus on knowledge emphasises the mathematics teacher's specific expertise as well as a vision of what to teach mathematics for and how to teach mathematics effectively (Ramos-Rodríguez et al., 2021).

According to a literature assessment undertaken by Harvard Family Research Project (2006), professional development is a critical activity in the whole system of staff development. Teacher learning training is a never-ending process that helps

teachers improve their teaching skills, grasp new knowledge, and create better or newer expertise, which in turn helps students learn better. Oguntimehin (2005) identified training functions as follows: improves skills, knowledge, understanding and attitude, improves the quality of work, and increases productivity.

Despite the poor performance of the first and second cohorts in mathematics teachers at SIPTT (see table 1.4), all interviewees (those who passed, failed, or withdrew) stressed that the obvious significant outcomes were the updating of teaching practices and the use of technology in teaching mathematics. In general, they indicated that their performance had improved compared to those who did not attend the training. The improvement of the trainee's performance in the workplace is one of the quality indicators of the programme (Harris & Sass, 2011; Oguntimehin, 2005).

Additionally, the study found the improvement of student achievement in mathematics as an indicator of training quality. Productivity is a concept often misinterpreted with efficiency by many people. However, both concepts exhibit similarities, yet they are different economic concepts. In the formal educational system, both concepts refer to a different relationship between inputs and outputs. Productivity can best be understood as output per unit of a measured input. When comparing productivity, the input can be constantly held, while the output is allowed to vary. For instance, the MOE can hold the service of a teacher constant while expecting his/her output to increase. Thus, productivity increases when the same input leads to a greater output than before. In essence, productivity is concerned mainly with the maximisation of output.

Professional learning is considered a product of both externally provided and job-embedded activities that increase teachers' knowledge and help them change their

instructional practice in ways that support student learning. Thus, the quality of mathematics teachers training represents a subset of the range of experiences that may result in professional learning (Darling-Hammond et al., 2017).

Students achievement will not improve without making required changes in teachers' classroom practices (Cohen & Hill, 1998; Kennedy, 2016; Mugarura et al., 2022). In early work on teacher productivity, researchers estimated education production functions by regressing aggregate student achievement levels on measures of teacher training (Harris & Sass, 2011).

This study finding showed that improvement in teacher-student relationship. Good relationships can be more impactful and lead to more positive feelings about self and academic achievement (Foley, 2020). According to Hattie (2009), research shows constructive teacher-student relationships have a large and positive impact on student academic results. Research assumes ineffective professional development impacts how professionals interact with students facing difficulties (Darlin-Hammond et al., 2017). Darlin-Hammond et al. further asserted that effective training activities provide the appropriate scaffolding for students struggling to gain suitable learning conditions.

The University of Cambridge (2010) report *Review and recommendations* recognized the positive attitude of Omani students to their learning by reporting that Omani students "… are diligent, respectful and clear in their answers of questions; behaviour in class is excellent and relationships between teachers and students are also extremely good" (The University of Cambridge, 2010, p.25).

Additionally, the interviews stated that the teaching strategies were applied in the classroom significantly motivated students to participate in the classroom and learn. The ultimate goal of teacher professional development is to improve students'

learning skills and learning outcomes. According to Al Shabibi et al. (2019) found statistically significant differences in the attitudes of students of trained teachers.

The present study's finding corresponds to a significant body of research that demonstrates that teachers and the quality of their teaching are crucial components of student learning (Cave & Brown, 2010; Desimone & Garet, 2015; Garet et al., 2011; Lipowsky & Rzejak, 2015; Pokharel, 2018; Yoon et al., 2007).

Another sub-theme of outcome is increasing research skills. It was also a key indicator of the quality of mathematics teachers training at SIPTT. Although some interviewees pointed out that action research was challenging, they benefited much from it, reflecting the programme's quality.

Similarly, Alshykairi (2020) found the same finding among the trainees of the supervisors training programme at SIPTT. The SIPTT seeks to develop positive perceptions among trainees towards scientific research, which is one of the main pillars the SIPTT aims to instil in trainees to become a continuous practice for them (Oman Education Council, 2018). The study participants' perspectives regarding research skills indicate the programme effectiveness (Cortes et al., 2021; Wahyuni, 2020), which ensures the quality of its content. Action research is considered to lead to the quality of instructional tasks in secondary schools in Ethiopia's Gedeo zone (Dulo, 2022). These activities may include training, action research, classroom observation, feedback, follow-up, and support, as well as facilitating effective ways for teachers to share their knowledge, skills, and experience in a more organised manner.

5.3 Weaknesses of the training programme

Like the strengths, the weaknesses indicators are sorted according to themes of the CAIPO training evaluation model to answer the second research question.

Regarding *context*, some interviewees expressed the inappropriateness of some of the training programme contents with the mathematics lessons. Some also stressed that the foreign educational models included in the training material are not suitable for the Omani school environment due to the different cultures. According to Al-Shabibi (2013), the programme must highly consider the reality of the education system to achieve the quality of training. However, helping teachers make the leap from learning something new to implementing it in the classroom is one of the biggest challenges professional developers face (Loucks-Horsley et al., 2010). Professional developers assess the current state of mathematics classroom practice to meet this challenge—the curriculum, instruction, and assessment practices and learning environments. It is vital to understand the unique features of the local context and use that information to inform the training design (Loucks-Horsley et al., 2010).

The second point in *context* is that although the majority of the interviewees appreciated the support of school principals and their colleagues to join the training programme, some stated that the school administration did not support them during the implementation of the training tasks in the school, who might not be aware of what was required of the trainees to implement in the school to enable them to complete the requirements of the training programme. The study result supports previous studies (Al-Shabibi, 2013; Dias-Lacy & Guirguis, 2017). The lack of school support had administrative consequences, indicated below.

The *administrative* aspects (such as one work-day release) to enhance the application of training in the work environment adversely affected the trainees as it

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increased their workload. Moreover, the trainer was forced to abbreviate some of the training content because of the intense training in the face-to-face component in five straight days. Thus, some trainees reported that some contents were not explained well, affecting the quality of the programme delivery. They also stated that many details of the training content could be missed, which the trainees might not realise, negatively affecting the quality of the programme. Likewise, the study found that most of the interviewees considered that the timing of face-to-face training was not suitable for them because it coincides with the teaching schedule. Because they had to miss classes, replacement teachers had to take over while they were away for training. Missing classes was also causing a work backlog.

Although some participants considered the release an advantage of the programme, others did not. They indicated a counterproductive effect of the one-day release because such a policy forces trainees to postpone their classes and replace them on other days, giving them more workload and work pressure than those who did not have to attend such training. The study findings showed that the teacher trainees have a real challenge due to the pressure of school schedules in Oman, as supported by Al-Shabibi (2013). This finding is consistent with Hicks et al. (2007) and Klein et al. (2006), who found that conflict training schedules influenced training quality. According to Salas et al. (2000), the quality of a training programme is highly dependent on the period.

The timing of face-t-face (five straight days during the school semester) made another challenge because training schedule affects training quality (Tabatabaei et al., 2021). It is also linked to administrative procedures and coordination discussed earlier. The participants indicated the negative effect on doing work duties smoothly for the

trained teachers. Schaffner et al. (2021) reported that a policy of school-level difficulties in releasing teachers for training influences the quality of training.

Identifying the gap in the quality of in-service educational services can be a good starting point for planning, prioritising, and allocating resources to improve education (Mahtalab et al., 2021). Öztürk (2019) and Sandanayake et al. (2020) recommended a clear specification of administrative guidelines for improving training quality.

In addition, the interviewees expressed that poor cooperation between the SIPTT and their schools negatively affected their performance in training. They noted that the lacked support from the school administration and because the MOE did not set a specific mechanism for transferring training from the training headquarters (SIPTT) to schools despite the MOE being the supervisor of both sides. Instead, the participants had to initiate the transfer of the new knowledge. However, their success depended much on the acceptance of the school administration over such initiatives. When learners return to their jobs, a lack of management support, organisational policies, and procedures can all have a negative impact (Almannie, 2015). Administrative interventions were required to improve secondary school teachers' quality teaching practises and ensure their effectiveness as teachers (Kombo & Kakuba, 2020).

Enhancing the application of training tasks in a work environment is a success factor of the mathematics teachers training to ensure continuous improvement in the trainees themselves or in transferring the knowledge and skills to their colleagues through guidance and/or workshops. Therefore, the school administration needs to be convinced of the importance of transferring training from the training rooms to the school environment.

The present study found that the challenge of administrative collaboration between SIPTT and schools is considered one of the main reasons for the low success

rate in the training programme or withdrawal from it (see Table 1.3) and the significant

decrease in the number of trainees in the second batch (see Figure 1.3). The finding of

administrative collaboration is consistent with AlOmairi and ALKiyumi (2020) study,

which investigated why novice teachers training at SIPTT did not fulfil the training

requirement. lack of institutional strategy influence teachers' professional

development (Aljassar & Altammar, 2020).

The collaboration challenge deepens due to the indirect relationship between the

SIPTT and the schools. The SIPTT is the supervisor of the training centres in the

educational governorates, which, in turn, supervise the schools in the governorates.

This administrative chain is supposed to smooth the flow of procedures and organise

the training process in line with the school's work scheduling. Alshykairi (2020), who

evaluated the training programme for supervisors at SIPTT, found similar challenging

issues. Facilitating administrative procedures has a major role in improving training

(Driskell, 2011). The cooperation between authorities strengthens the quality of the

training programme (Uysal, 2012).

The SIPTT has a clear procedure for selecting candidates to join the training

programme. The candidates have to be experienced mathematics teacher from Omani

public schools (grades 5-10) (Al-Jabri et al., 2018). By doing so, trainees would

transfer the training through the application of training tasks to form the nucleus of

change in the work environment through professional learning communities.

However, the interviewees indicated that they did not know about the mechanism of

nomination and selection of trainees in this voluntary programme. That is because the

SIPTT's website does not include the nomination and selection procedure clearly.

Therefore, the mathematics teachers who desired to register did not know the extent

of their eligibility to join this programme. The literature suggests that the nomination

process is required to ensure the quality of the training programme (Al-Alawi, 2003; El Hajjar & Alkhanaizi, 2018).

The study also showed no precise grading for evaluating the trainees' performance, whether it was excellent, very good, good, or acceptable, decreasing their motivation and competition between trainees for distinguished achievement. The participants expressed that lacking a standard classification affects assessing trainees' performance. According to their opinion, that may affect the objectivity of the assessment. Quality-based performance may not be rewarded to encourage trainees. Individuals and groups provided quality training may be influenced by "anti-quality" behaviours modelled by fellow employees or members of management who have not committed to quality (Palan, 2007). Therefore, to improve the quality of the training programme, there must be clear assessment criteria for the trainees.

Furthermore, one of the critical weaknesses expressed by interviewees was the value of the training certificate. They indicated that the certificate did not give them an advantage in their career path nor distinguished them from other trainees. The perceived value of the certificate was found to be a significant factor in trainee motivation and deciding whether to continue participating in a voluntary training programme. This study found that vague certificate value is one of the reasons for the severe decrease in enrolment in the second cohort in this non-mandatory programme (see Figure 1.3). Organisations should explicitly link performance to rewards and emphasise the value of training to improve performance and other incentives, such as greater promotion opportunities (Buckley & Caple, 1990; Cascio, 1994). Therefore, the training certificate is a significant factor in determining the highest possible enrolment rate to achieve the SIPTT target (see figure 1.3).

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Some trainees expressed that the design of the training programme and its required tasks in each training component in the two-year training made it difficult to understand. It is not surprising that they complained about the difficulty of understanding the design of the training program because teachers were not used to attending such a training programme that has three components (face-to-face training, online, and workplace task applications), as these components were designed in a cumulative, sequential manner. By designing the programme in this way aims could enhance the practical skills of teachers in their schools, hoping that student achievement could be generally improved and in TIMSS specifically (see Table 1.2). Such design was lacking in the previous training programme in the governorates.

Some trainees believed that the intensity of the training content was unequal in the four training modules, despite the same training period. The challenges of the programme *inputs* focus on the enormous number of training tasks, especially action research. A training overload can all have a negative influence on learners when they return to their job (Almannie, 2015). The result of the interviews indicated that most trainees lacked interest in conducting action research. In fact, the participants who failed the programme did not submit the action research task because they were not convinced of its usefulness and hence lacked the desire to implement it. The unwillingness to complete the task is a real challenge for the employees of the MOE. Besides, this study found that the trainees had insufficient knowledge of research skills, consistent with the finding of AlOmairi (2021, in press).

In 2020, the evaluation department at SIPTT studied the impact of three training programmes (Mathematics, Science, and Field Two) conducted by the SIPTT. The SIPTT (2020) findings showed that the SIPTT graduate trainees did not conduct action research in their schools after the training programme. The graduates of the

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mathematics programme did not have much action research skill compared to those in Science and Field Two programmes. By including action research in all SIPTT training programmes, including the mathematics programme, the MOE hopes to instil a culture of scientific research among the teachers (Oman Education Council, 2018).

The study found that the indicators of poor programme quality in the training *process* are that online training was the weakest compared to other training components. the content of online training was theoretical, including the tasks to be accomplished. Besides, the electronic mathematics teaching applications were poor compared to the trainees' expectations before joining the programme. According to the participants, the training tasks in this particular component were theoretical and did not enrich their skills. Technological environment during mathematics teacher training, benefited the development of content, pedagogical and technological knowledge for teaching (Anat et al., 2020).

Additionally, they encountered technical problems, influencing their participation and discussion in this particular component. As a result, the online training quality was affected. AlOmairi (2021) also reported a similar issue raised by trainees in many training programmes (2020/2021 cohort), including mathematics training at the SIPTT. The present study's finding contradicts the study of Osman (2017), who found that trainees trained online performed significantly better than those trained face-to-face.

The weaknesses discussed in the *context, administration, input and process* of the mathematics teachers training programme explain the lowest success rate in the first and second cohort in comparison to other training programmes at the SIPTT (see Figure 1.2) and the severe decline number of mathematics teachers enrolled in the voluntary programme in the second and subsequent cohort (see Figure 1.3). Despite

the minor challenges, the findings revealed that the programme has a quality on achieving the planned objectives (see Table 1.2).

5.4 Proposed training evaluation model

The majority of traditional evaluation frameworks would have difficulty including this voluntary training that consists of three different components (face-to-face, online, and workplace tasks applications). This is because they use a goal-oriented approach and look for signs of organisational transformation. Identifying examples of method application using the standard no/yes criteria or trying to determine the implementation of abilities taught explicitly in these programmes may show challenging. This is because trainees take various tools home and customise them for the educational environment, assisted by the general nature of the content, which facilitates the transfer of learning to the workplace. If the participants did not attend the mathematics teacher training to become engaged teachers, assessing a course in this manner will almost certainly result in dissatisfaction. This, however, is specifically what the existing goal-oriented, organizationally cantered frameworks would accomplish. This research shows that a qualitative, individual-focused method to evaluation might make it easier to determine the quality of mathematics teacher training.

Comparing the training evaluation models (section 2.5) and choosing the CAIPO model that suits the context of the training programs at the SIPTT. Besides, reviewing previous literature related to variables of training quality (section 2.7) guides the conceptual research framework (Figure 2.3). It is worth noting that the study findings revealed detailed indicators that were not addressed in the conceptual

model because it is difficult to determine in advance; context and outcomes. This qualitative research investigated the trainees' perspectives and the findings (see chapter 4, section 4.3 and section 4.7) revealed these indicators: context (supportive school environment and professional learning communities) and outcomes (trainees' satisfaction, teacher skills, teacher productivity, and research skills), these critical indicators is a theoretical contribution of this study. Therefore, the study developed a training evaluation model that in line with the voluntary training programme at the SIPTT context in particular. It is vital to be considered to ensure its quality. Figure 5.1 shows proposed training evaluation model.
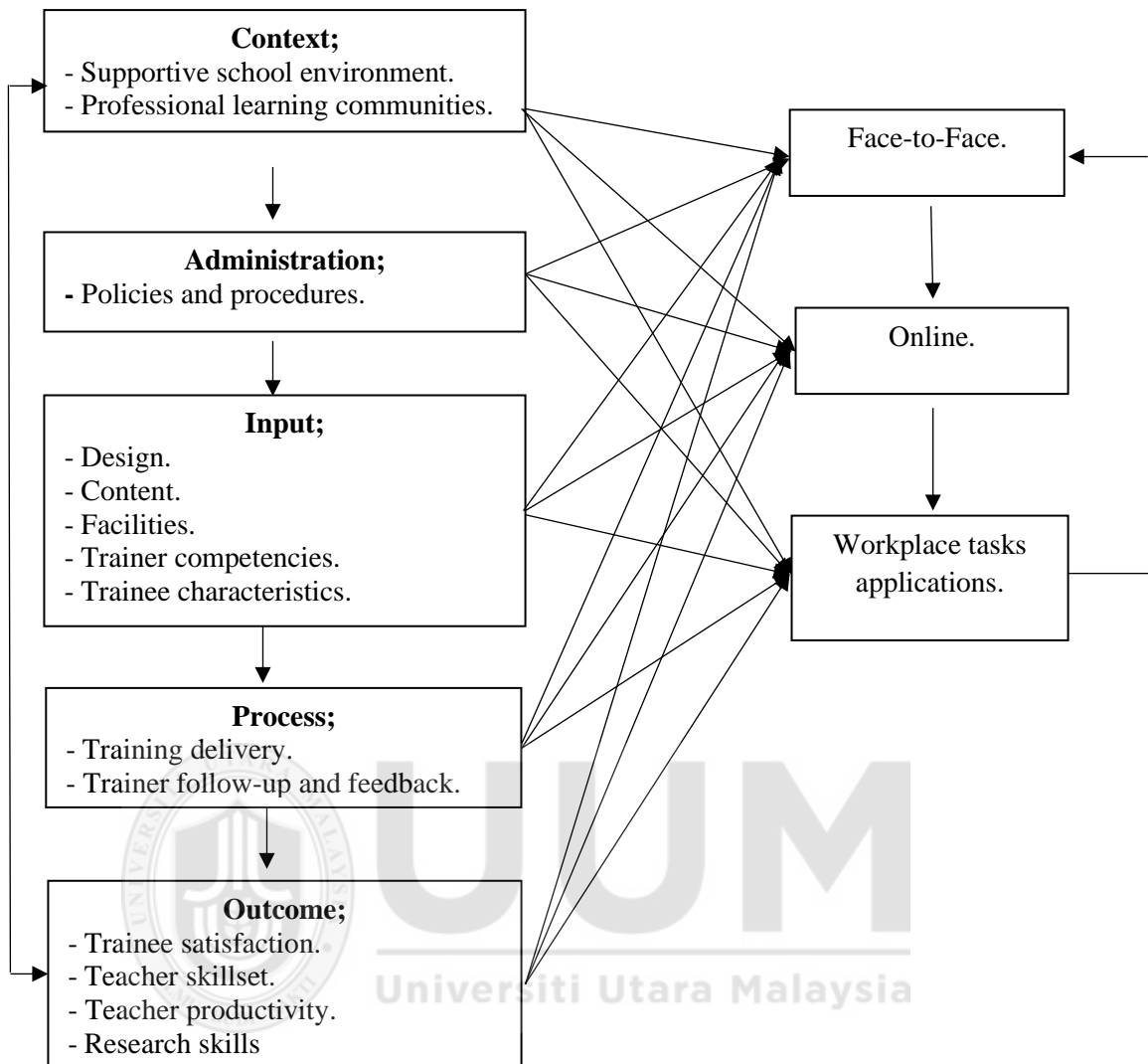
Figure 5.1 Proposed framework for evaluating the training quality at the SIPTT.

The research findings showed the importance of detailed knowledge of the quality of the three training components (face-to-face, online, and the workplace tasks application) in the training program (figure 1.1). Each component differs in the training period, method, interaction with trainer, training tasks required, and the geographical difference in the work environment of the trainees (Schools from different regions across the country) when accomplishing the training tasks. This detailed focus helps to assess the quality of each component individually. The study

showed that the quality level of each component differs from the other (for example, the trainees expressed their satisfaction with the quality of face-to-face training as opposed to online training). Focusing on quality indicators (figure 5.1) in the three components of the program makes it easier for those in charge of the program to emphasis on the required updating instead of making an absolute general judgment on the training program. Therefore, the proposed model helps to know the strengths and shortcomings of the program which facilitates the improvement of the quality of the programme.

5.5 Summary

This chapter discussed the findings to understand participants' assessment of the mathematics teachers' perceived quality since each individual had unique experiences, expectations, wants, and needs from such training. Hence, a general, quantitative, goal-based evaluation might not be appropriate to investigate these aspects. Instead, an improved framework to assess the mathematics teachers training at the SIPTT that incorporates the participants' values was required. The interviews showed the difficulty of balancing schoolwork (teaching and non-teaching) and attending face-to-face training for five days each school semester.

Furthermore, applying many training tasks required to pass the programme was the main reason some trainees did not submit the required tasks and subsequently failed or withdrew from the non-compulsory mathematics teachers training programme. For these two groups, they perceived that the training certificate was not

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linked to their career path. Hence, the administrative aspects should be reviewed to overcome low participation in subsequent cohorts.

Based on the findings, the proposed evaluation training model highlights the key indicators of the quality of the programme. It helps to investigate each training components in a sequential manner.

The last chapter concludes the present study, and the participants' recommendations to improve the programme quality are outlined. Also, it highlights the theoretical and practical implications and suggestions for future studies.

CHAPTER SIX

CONCLUSION

6.1 Introduction

This concluding chapter reviews the extent to which the objectives and questions presented have been met. It reveals the strengths, weaknesses, and recommendations from the participants' viewpoints to improve the mathematics teachers' training at the SIPTT. Based on the study findings, the researcher proposes an enhanced training evaluation model (see Figure 5.1). The proposed model extends CAIPO (Easterby-Smith, 1994) by including main indicators of the quality of training components (face-to-face, online, and workplace tasks applications) at the SIPTT context. This chapter considers the theoretical, practical, and methodological implications. The chapter ends by identifying potential study areas.

6.2 Recapitulation of the Study

The main aim of this study was to investigate the quality of the mathematics teacher training programme at SIPTT from participants' perspectives. Specifically, this study investigated the strengths and challenges of the training components (face-to-face, online training and workplace tasks applications) based on the CAIPO training evaluation model.

The current study adopted a qualitative study design approach. It selected the first (2014-2016) and the second (2016-2018) cohorts of voluntary mathematics teachers training cohorts at the SIPTT in Oman. The study targeted trainees who passed, failed, and withdrew from seven educational governorates to maximise the best understanding of why mathematics trainees' performance was the worst in these

cohorts compared to other participants in other training programmes at the SIPTT. It also sought to understand the severe decline of voluntary trainees in the second cohort.

6.3 Summary of findings

The findings indicated five emerging themes based on the CAIPO evaluation model, showing the strengths and weaknesses in implementing the mathematics teachers training at the SIPTT. The findings revealed five main themes and fourteen sub-themes that reflected the strengths and weaknesses in each training component (face-to-face, online, and workplace tasks applications).

6.3.1 Strengths indicators

The research findings showed several strengths indicators in the mathematics teachers training programme at the SIPTT which summarized as follows;

- **Context** theme:
    - *Supportive school environment* represented by the principal and peers in both stages (pre-and during training) had significant effects on recruitment and continued in the voluntary training programme.
    - The surrounding *professional learning communities* influenced the applications/transfer training in the workplace.

- **Administration theme:**
    - SIPTT supportive *procedures* (e.g., training briefing and one-day release from work duties) motivated trainees to join.

- **Input theme:**

  - The *design* of the mathematics teachers training programme is among the strengths that distinguish the programme from other training programmes in the Omani educational governorates. Hence, that enhances its quality in achieving the aims of the programme.

  - A significant *practical content* component is desirable in mathematics teacher training courses to help entrench learning and illustrate the relevance of concepts.

  - The availability of training *facilities* in the programme has enriched the quality of the training programme.

  - The interviewees place a high value on a *trainer* with practical experience in mathematics teacher training because the knowledge gained from doing the job is seen as considerably more valuable than merely knowing the subject matter.

  - Many of the highlighted *trainee characteristics* (readiness, motivation and self-efficacy) were stated (or implied) by participants as having an influence on the quality of mathematics teacher training.

- **Process theme:**

  - The evidence indicates that the *trainers' delivery* style during face-to-face training enhanced the interaction between the trainees. Thus, this component in the mathematics teachers training at SIPTT is considered the best among others.

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- *Trainers' follow up and feedback* strengthened the quality of face-to-face and workplace tasks applications components in the mathematics teachers training at SIPTT.

- **Outcomes theme:**

  - Despite the challenges, the *trainees' reaction* to the training programme was very satisfactory, which raises the possibility to attract more trainees in the future to this non-mandatory programme (see Figure 1.3), which is the SIPTT seeks.
  - The training programme had a positive impact in enhancing *teacher skills* (self-reflection, self-evaluation, mentoring, using technology in teaching, updating teaching methods and classroom management skills).
  - The application of the teaching strategies had positively tangible impact on *teacher productivity* through student motivation, participation, and achievement.
  - Training tasks, with action research in particular, are important in developing the teacher's professional practices and *research skills*. It is a strong point that adds to the quality of training programme.

6.3.2 Weaknesses indicators

The study indicated some weaknesses in the programme from the participants' perspectives as discussed in section 5.3. The key weaknesses of mathematics teacher training are also classified based on five themes (see previous section 6.3.3) and summarised below;

- **Context** theme:

    - The *incompatibility* between foreign teaching models and the Omani school environment hurt the application of some training tasks, negatively affecting the quality of the training.

    - The *lack of the principal's support during implementing the training tasks* in the school made it difficult to deliver the tasks on time.

- **Administration theme:**

    - SIPTT procedures (inappropriate face-to-face timing, vague nomination and selection, lack of coordination between SIPTT and schools) caused extra workload. As a result, mathematics teachers hesitated to enrol in the programme.
    - SIPTT policies (uncertain grading system, vague training certificate value in teachers' career path) demotivated trainees to join as well.

- **Input theme:**

    - New SIPTT training design with three components (face-to-face, online and workplace tasks applications) confused some trainees who attended previous training (mostly face-to-face component) in educational governorates. So, explaining the structure well might clarify ambiguity.

    - Training content (theoretical content in online training, unequal intensity of the training content between the four modules) affected the quality of the programme.

- **Process theme:**

  - The Lack of trainees' participation in online training due to theoretical contents, causing trainees underestimating its value.

  - Difficulty in balancing between accomplishing training requirement and school duties. Consequently, modifying SIPTT procedures will directly influence the training process.

6.3.3 Proposed model of training evaluation

After reviewing previous literature linked to the quality of the training and variables related (section 2.7). Based on that, the researcher conceptualised the study framework (see Figure 2.3) to guide this qualitative study. Then, the researcher sought understanding the quality of a mathematics teachers training programme from participants' view. By determining the key indicators of the strengths and weaknesses of the programme, the study came up with this proposed model (see Figure 5.1) that cover three different training components applied in the same training programme which lasted for two years. The key indicators each theme should be considered in all three training components to evaluate the quality of the training programme.

6.4 Research recommendations

The study also extracted recommendations to improve the quality of the training programme and overcome the challenges identified in the second research question. The recommendations cover the three components of SIPTT training programmes

(face-to-face, online, and workplace task applications). The study found that increasing school administration support to the trainees is essential, especially during the implementation of the training tasks. The encouraging work environment is considered a vital factor in training transfer, whether to the trainees themselves (to continue the voluntary training programme) or their non-trained colleagues to help develop a culture of professional learning communities among the teachers. Expanding the establishment of professional learning communities, whether at the educational governorates or according to their specialisation, is essential, as is the case in various disciplines of professional societies.

The interviewees highly recommended a clear integration and joint coordination between the SIPTT and school administration concerning (a) sending the SIPTT training plan and the list of trainee candidates to schools before the beginning of the school semester to harmonise school schedules and prepare trainees to balancing school duties and the training programme, (b) circulating the mechanism of nomination and selection of trainees, (c) clarifying the structure and objectives of the training programme and circulating them to school administrations (assuming that this is already clear to teachers is not always true), (d) reducing the trainees' teaching schedule, (e) not assigning them non-teaching duties, and (f) choosing the appropriate time for trainees to attend face-to-face training so that they could manage their time effectively between performing their duties as a teacher and attending and completing the training tasks required to pass the programme. This study found that the difficulty of managing time and work pressure was a significant factor for trainees to withdraw or not submitting training tasks. All collaboration techniques mentioned will promote the participation of stakeholders, hopefully boosting training quality (SIPTT), teacher

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productivity (personal and professional development), and student achievement (school improvement).

Moreover, participants suggested that the trainees' results are categorised to clarify the grading system for two reasons: (a) such a system could motivate trainees and increase competition in performance, improving the quality of the training programme, and (b) such assessment levels could be linked to the professional career in the future if the certificate is linked to the trainee's performance. Likewise, most interviewees recommended that the training certificate must have value for their career path. Presently, the mathematics teachers training graduates did not see a tangible impact of the certificate to distinguish them from non-trainees. This factor was found to be critical for some trainees to voluntarily continue with training despite the two-year period of training they have to undergo. Therefore, linking the training certificate to the teacher's professional path incentivises others to join this non-compulsory training programme.

The interviewees also stressed that SIPTT needs to continuously recognise the graduates by hosting them in educational forums or sharing their experience during training sessions. Such an intangible incentive could determine their decision to continue to be trained. Equally, the practice is an implicit indication to non-trainees of the extent of the SIPTT post-training support and follow-up, boosting their professional development on an ongoing basis. This finding broadly supports the work of Alshykairi (2020) in Omani educational training in particular.

As for the inputs of mathematics teachers training programme, the interviewees' recommendations focused on replacing the Western models of teaching included in the training content with the Omani models that better represent the reality of the school environment. The latter is more convincing to the trainees in terms of its

usefulness and suitability for Omani students. Al-Shabibi (2013) showed that the school context is critical in the experience of Omani novice teachers.

Also, the participants suggested adding applications to teaching mathematics in the online training component. Especially important was that most interviewees expressed that the online training was very much theoretical. Hence, this recommendation helps promote the use of technology more, particularly in light of the increasing trend of interest in e-learning in schools, which is evident during the coronavirus pandemic.

Reducing the intensity of training tasks is among the most important recommendations made by the interviewers. This finding is consistent with Alshykairi's (2020) recommendation to the SIPTT. According to the participants, this could be done in three ways: (a) reducing the requirements of action research task, (b) replacing action research task with another practical task related to teaching mathematics, and (c) making some training tasks optional so that trainees can choose the training tasks that meet their needs. They further anticipated that such a move could increase the enrolment rate in the voluntary programme as well. However, a research culture among teachers could be developed by emphasising the importance of action research in the training content in overcoming school, teachers and student performance challenges. This can be accomplished by promoting the best action research among the SIPTT trainees in the SIPTT's library and publishing them in scientific journals or educational publications.

Although many interviewees praised the trainer's performance and efficiency, they suggested that more than one trainer should be assigned to the training group to take advantage of their different skills and experiences. By doing so, the participants' learning could be further enhanced, reflecting the programme quality. Previous studies

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(e.g., Omollo et al., 2017; Karim et al., 2012) asserted that participatory training alters learners' attitudes, behaviours, and functioning by influencing their perceptions of their skills and capabilities.

A few interviewees recommended intensifying the follow-up of the trainer and providing feedback to the trainees, especially when performing the required tasks in their workplace. However, this recommendation is not a vital observation for the development of the programme, especially since many interviewees praised the role of the trainer in providing feedback and follow-up. In fact, this recommendation was given by those who did not complete the training and made a quick conclusion and judgement of the trainers. In any case, the recommendation should not be omitted because it could motivate the trainees to continue with the non-mandatory training programme.

Additionally, some interviewees suggested increasing field visits to their schools so that the SIPTT could have a general idea of the obstacles some trainees face in their workplace. The field visits could enhance trainee commitment to applying the new skills in the work environment, thus, reflecting the reputation and quality of the training programme. The visits could also promote the voluntary programme to potential trainees, thus addressing the sharp decrease in enrolment (see Figure 1.3).

Regarding online training difficulties, the interviewees strongly recommended solving the technical issues, which have also been raised by Omani scholars and researchers (AlOmairi, 2021; Alshykairi, 2020) investigating the SIPTT training programmes.

Importantly, this study recommended that the SIPTT can adapt the proposed evaluation training model (see figure 5.1) to enhance the quality of the three training components (face-to-face, online, and workplace tasks applications). When the SIPTT

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consider the key indicators specified in the proposed model, the more opportunity will be available for improvement to achieve the ultimate educational objectives.

6.5 Research Implications

6.5.1 Theoretical implications

The focus of this study was to gain an in-depth understanding of the factors influencing the quality of mathematics teacher training in the SIPTT in Oman by considering the environmental difference between the training centre in the SIPTT and trainees' schools. An extensive review of the literature in relevant areas was conducted to achieve this aim. The internal environmental context of the institution significantly affects the processes of training quality (Tews & Noe, 2019). This research fills the contextual environment gap in addition to answering earlier calls for more empirical studies on the main ingredients of effective training practices in Oman (Alaraimi & Othman, 2015; AlBalushi, 2018; Al-Jabri et al., 2018; Al-Hosni, 2014; Al-Mughairi, 2018; AlOmairi, 2021; Al-Omrani, 2014; Alshykairi, 2020; SIPTT; 2020; Rajasekar & Khan, 2013). Investigating trainees' perceptions of the training programme is the contribution of the present study to the literature. Secondly, only a few studies had paid attention to the quality of non-mandatory, non-profit training. The training type (mandatory/voluntary) affects the motivation of the trainees to transfer training to the work environment (Naquin & Holton, 2003, Kodwani & Prashar, 2021) and training effectiveness (Sitzmann & Weinhardt, 2019). Therefore, this study looked at the quality of voluntary mathematics teacher training in SIPTT to fill the gap in the Oman context. Essentially, this research further contributes to the existing body of knowledge by investigating the effectiveness of voluntary training programmes (Huang et al., 2014; Gelkopf et al., 2008; Meier et al., 2012).

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Thus, the current qualitative research contributes to the body of knowledge of training quality literature by building on previous studies and ideas (Huang et al., 2014; Vermeulen et al., 2016; Putra, 2013; Bof, 2004; Diamantidis & Chatzoglou, 2014; Martins et al., 2019; El Hajjar & Alkhanaizi, 2018; Santos & Stuart, 2003). Since there is a crucial need for more research with a theoretical foundation (Easterby-Smith, 1994) to give a new understanding and perspective of the quality of mathematics teacher training at the SIPTT in Oman, considering the participants' training quality suggestions in light of the controversial academic arguments provides a novel contribution to the literature. Also, although confirming causal relationships between training and workplace changes are exceedingly challenging (Alliger & Janak, 1989; Alliger et al., 1997), utilising the indicators reported in this research can aid in understanding the subjective assessment of the training programme's quality.

Furthermore, there is a distinct and clear void in the present studies on the quality of training that trainees expect to have received from the SIPTT training programme. There is a restriction on the existing training evaluation framework in the MOE in Oman (see Figure 2.1) due to different training structures that mainly depend on the face-to-face method. Such structure does not provide reliability to implementing the SIPTT training plan that involves three components (face-to-face, online training and workplace tasks applications). It also does not answer questions regarding the MOE procedure in Oman that can profoundly influence programme quality (Knowlton & Phillips, 2013). So, investigating the trainees' views on the quality of the administrative procedures of these components in SIPTT has filled this gap and helped understand participation decline and withdrawal and in the programme.

6.5.2 Practical implications

Although each training quality factor (see section 2.3) had been studied individually, previous comprehensive investigation has been studied (face-to-face training, online training, and workplace tasks application) (see Figure 1.1) combined as one training programme and relative contribution to training quality in a natural setting. This adds new insights into the actual training practices in the SIPTT instead of focusing only on the impact of the SIPTT training programmes. Additional research is necessary for MOE management, trainers, school administration, and trainees to understand which factors influence the quality of the three components of the SIPTT training programmes.

The study findings will aid in comprehending participants' perceptions of the perceived quality of mathematics teacher training courses, resulting in a more precise alignment of delivery with the needs of individual trainees. This increased recognising can benefit training administrator procedures (in aligning programmes with school environments and participant requirements and better marketing to participants to overcome the continuous decline in participation and withdrawal), instructors (in guaranteeing the effectiveness of process alignment: delivery and follow-up), and course designers (in understanding the training input challenges, i.e., exhaustive training tasks). Additionally, enhanced evaluation competences and enriched programme delivery resulting from a greater understanding of trainee perceptions of quality can serve as an effective sales tool for programme providers (in this case, the SIPTT). The provider's ability to articulate and successfully execute a fulfilling participant value proposition will enhance demand and facilitate expansion.

This study output is expected to be utilised by a range of a variety training stakeholders for various purpose. The framework is not overly inflexible in terms of

the evaluation's output, and once the most critical aspects have been found through interviews, the decision on how to present them can be decided on a case-by-case basis, depending on the target stakeholders. The evaluation outcome will be highly reliant on the evaluation goal and the stakeholders who will receive it (Alliger et al., 1997; Bryson et al., 2011; Kunene, 2017; Powell & Yalcin, 2010). This enables the evaluation to meet the needs of many stakeholders in an organisation (Nickols, 2005), and the same data can be presented in different ways (Dionne, 1996). The study findings can be utilised by everyone involved in mathematics teacher training in education.

Further, training coordinators have been classified as a stakeholder that encompasses those individuals inside the MOE in Oman involved in the licensing, procurement, and training administration. Typically, their role inside an establishment is to organise the SIPTT training programmes that meet both teachers and MOE objectives for professional career growth and increased operational efficiency. The outcomes of this study can benefit SIPTT training coordinators in two ways: first, by knowing participant views of programme quality to design provision that is more aligned with needs and improving the SIPTT's initiatives to market and promote voluntary training courses within MOE in Oman.

Additionally, training coordinators in the SIPTT can assess the school environment (context) in which the training will be conducted and whether or not the prerequisites for transfer to the workplace are in place. The literature and this study have established that supervisory support, motivation to transfer, and opportunities for application are critical post-training characteristics that determine the quality of mathematics teacher training. While training coordinators may have little control over these variables, the trainees suggested that cooperation must occur between the SIPTT

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and the school administrations to facilitate the process of implementing the training tasks/transfer training in light of the teaching workload of the trainees.

While focusing on organisational improvement is critical from a managerial standpoint, it can limit the effectiveness of the training by occasionally masking unanticipated outcomes. Considering participants' opinions of training quality enables comparisons between intended, expected outputs and subjectively perceived improvements in attendees' experiences. This is especially true when the motivation for attending training is voluntary and participant-driven. It is recommended that these data might be utilised to update the planning process, resulting in a more conducive atmosphere for training delivery and subsequent transfer. Focusing on selecting the appropriate methods should emphasise trainee experience and expectations to confirm that a homogeneous group of individuals is motivated to attend. This will ensure that all attendees have comparable levels of ability and knowledge and allow the course (face-to-face, online and workplace tasks applications) to develop at a speed and level suited for everyone. The objective of the training (teacher professional development) will therefore inform the instructor's or training provider's selection in the SIPTT, as this is regarded to have a significant impact on participants' quality assessments. After considering these elements and contextualising the training in the SIPTT, the programme itself can be determined utilising the characteristics indicated under the title programme. For mathematics teacher training, the parts that participants valued the most were the practical tasks that encouraged the application of the new expertise and demonstrated that the strategies are not merely theoretical. These elements should be key to the contractual brief or work statement provided to the supplier when licensing the SIPTT training programmes. Additionally, they are tangible outputs that

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the client (trainee teachers) can evaluate, and the training provider can prove specification compliance.

When it comes to scoping the educational training, every designer must have a firm grasp of participant experience and expectations. Failure to recognise this can result in creating a programme that does not meet criteria or is too difficult for the intended teachers; thus, consideration should be given to both aspects. Likewise, the earlier themes of context, administration, and input are critical for appropriately framing the educational training course for attendance and the MOE requirements. As such, due consideration must be taken to the characteristics mentioned above.

From the perspective of the educational training course designer, the most evident application of the findings to practice is the features highlighted under the input of the three components of SIPTT training (face-to-face, online and workplace task applications). These characteristics should inform the pedagogical method used to develop all areas of programme delivery in each component with quality indicators in mind. Additionally, it ensures that the training course is aligned with the quality proposals of the course participants (mathematics teachers who will apply the learning).

While a designer cannot affect principal/supervisory support or opportunities for application in the workplace, the learning and materials (both face-to-face and online) can be arranged to increase motivation to transfer (workplace task application). This relates to the transferability of both content and takeaway materials to encourage trainees to apply their learning in the workplace.

Trainers are accountable for delivering the training event, and while an understanding the trainee teachers' work environment is beneficial, the instructor's primary focus should be on the training itself. If the coordinators and designers in the

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SIPTT have carefully built the training around the characteristics that influence perceptions of quality, the instructors' primary objective while applying these research findings will be to confirm that the indicators of quality are delivered. Some of these can be accomplished in the training session (both face to face and online), while others require additional preparation for the return to the job (tasks applications component). As a result, the training course should be linked with participants' judgments of quality in the context of mathematics teacher training. A critical point to explore is the subject of input. The primary advantage, and the element most highly regarded by trainees, was the instructor's knowledge and experience. By connecting the training delivery with their expertise and demonstrating real-world applications of the learning through example and anecdote, the teacher will increase the quality. Additionally, acknowledging that the most valued output for some trainees will be teacher productivity demonstrates that, while the trainer is delivering potentially new concepts, there is a recognition that, for some in the room, the most valuable output will be confirmation that they are already doing their assigned duties effectively.

Additionally, while instructors are unlikely to perform the training evaluation themselves, consideration of (SIPTT administration procedures) and response to (outcomes) can result in a more aligned and tailored training experience to participants' needs and objectives. The emphasis is no longer solely on the MOE progress but also on individual development plans; this enables consideration of a teacher's interest (e.g., the value of a training certificate) in his or her career path.

6.5.3 Methodological implications

The findings presented in this study suggest that emphasising the person may be more effective than seeking to implement organisational change due to mathematics teacher

training interventions. Although the majority of popular frameworks (Brinkerhoff, 1987; Bushnell, 1990; Cervero, 1988; Easterby-Smith, 1994; Kirkpatrick, 2015; Phillips, 1997; Stufflebeam, 1987; Warr et al., 1970) attempt to determine and evidence a link between training and tangible organisational impact, the data from this study suggest that it may be more appropriate to determine whether trainees make any perceived connections. The study findings show that each trainees attended mathematics teacher training for a variety of reasons and thus perceived quality differently. Some of these reasons directly influence the organisation and can be quantified (for instance, the ability to increase student achievement). Others indirectly impact the organisation but are difficult to measure (for instance, increased self-confidence in an existing skillset). Evaluating mathematics teacher training programmes based on organisational impact does not always reflect the participant's perception of quality in an educational setting. However, the data concur that an individual's training programme assessment is significantly affected by their expectations (Santos & Stuart, 2003). As such, it is argued that a programme should be constructed to accomplish those goals.

Easterby-Smith's (1994) training evaluation method as the foundation for the research allowed for an in-depth investigation of participants' perceptions of the quality of mathematics training and factors, they deemed significant. This results in a classification of the study's strengths, weaknesses, and recommendations, suggesting that a qualitative form of inquiry may be more appropriate for evaluating mathematics teachers' training in this situation. The majority of evaluation models seek to limit the influence of human bias in evaluation by being highly quantitative and offering data, such as return on investment, to illustrate the success or failure of training (Tasca et al., 2010). However, given that the findings indicate that each participant seeks unique

goals from mathematics teacher training, it is proposed that approaching evaluation from an individual perspective may be preferable.

This study supports the idea of using context as a lens to evaluate mathematics teacher training quality, consistent with Easterby-Smith's (1994). The present finding shows that context adds a new dimension of 'professional learning communities' not considered directly in his model. In addition, the model emphases not only on organisational culture but also on human background and position in the context part. It examines the value of pre-course preparation based on participant experience, content transferability, and a relationship to present employment. The qualitative technique of investigation provides for a time dimension to the reflection often overlooked by other taxonomies. Instead of seeking to link with (and prove) organisational effect, this exploratory qualitative method places the individual at the centre of the assessment. Given the nature of the individuals and their expectations, a different focus could be more significant.

Much research on evaluating training quality have been positivist, attempting to establish causation between independent variables (individual and/or organisational elements) and dependent variables (training quality). However, evaluating training quality is a complex issue as it involves many stimuli within a person and the environment, as the present research has shown. Hence, the positivist approaches have limited diagnostic utility for human resource practitioners. This means that researchers and scholars need to move beyond the positivist approach to investigate the participants' lived experiences about the training programme they underwent.

Most training quality studies were quantitatively conducted (Rafiq, 2015). Rather than quoting the traditional 'context v administration v input v process v outcome' criteria (Easterby-Smith, 1994) for success, equally effective in recognising

participants' success of the SIPTT training is the use of qualitative indicators. Using this approach enables researchers to look into the applications and advantages hidden from the quantitative evaluation (Robertson, 2015). Furthermore, instead of evaluating training quality only from an institutional perspective (e.g., SIPTT, 2020), doing so from an individual perspective helps uncover training aspects that seem to be particularly relevant for the individual trainees that should be worthy of attention in any SIPTT evaluating training quality practices. As a result, the findings of this qualitative study might facilitate the formulation of quantitative indicators to measure the quality of the SIPTT training programmes based on the CAIPO evaluation model.

6.6 Study limitations and directions for future study

This study has several limitations, as follows:

(a)   It investigated training quality at a single site (i.e., SIPTT). The findings of this study are not generalisable to other training centres due to the different interpretations and applications of programme guidance possible at other locations.

(b)   Interviews were limited to mathematics trainee teachers and did not involve SIPTT administration, trainers, principals, or educational supervisors in MOE. Data from other stakeholders could offer additional insight into to the quality of mathematics teachers training.

(c)   This research relied on a single data type, i.e., interviews, to investigate programme quality. Additional data types would allow for data validation via triangulation (Lodico et al., 2010).

This study depends on a small number of interviewees in mathematics teachers training within MOE in Oman and investigated its quality by understanding the programme's strengths and weaknesses guided by the CAIPO training evaluation model. Future research could consider two avenues to assess the SIPPT training quality further: (a) using a mixed-method approach to investigate each SIPTT training component (face-to-face training, online training, and workplace task application) separately guided by the CAIPO model, and (b) investigate other factors in the school environment that could help identify its role in influencing SIPTT training quality.

6.7 Summary

This chapter summaries the findings of this study. The findings revealed five emerging themes based on the CAIPO evaluation model, showing the strengths and weaknesses in implementing the mathematics teachers training at the SIPTT. This chapter presents the key findings based on the participants' perspectives regarding the three components of the training programme practices (face-to-face, online, and workplace task applications). This chapter concludes by identifying the key indicators of the training programme that could be considered to enhance the quality of the SIPTT training programme and, subsequently, the educational quality in Oman.

The problem statement discussed in Chapter 1 shows a need to qualitatively explore the quality of mathematics teachers training in the SIPTT from the trainees' standpoint. Therefore, this study investigated the strengths and weaknesses of the training components (face-to-face, online training, and workplace task applications) based on the CAIPO training evaluation model. Participants' recommendations for improving the quality of the programme were obtained.

Due to coronavirus pandemic restrictions, this study used online/phone individual interviews to collect the data. The findings revealed five main themes and fourteen sub-themes that reflected the strengths and weaknesses in each training component. Overall, the results suggest that the interviewees perceived many strengths in the mathematics teachers training at SIPTT. While they reported many challenges in administrative aspects that contributed to participants' failing the programme, withdrawing, or hesitating to enrol in this voluntary training programme. The participants encountered difficulties during the application of training tasks as they hindered accomplishing work duties in school. Some SIPTT administrative procedures (such as one-day release from duties and attending face-to-face training five days a week in each semester) had had adverse consequences in increasing the work pressure of the trainees, which heightened after they joined the training programme. Due to the length of the training programme (i.e., two years), some even withdrew altogether, negatively affecting the enrolment rate in the second and subsequent cohorts. It is evident that major administrative modifications are required, especially the collaboration between SIPTT and the schools across the country to facilitate training for mathematics teachers. Based on main indicators identified, the researcher proposed an enhanced training evaluation model consistent with the SIPTT training programmes in Oman. The proposed model (see Figure 5.1) facilitates evaluation of the quality of training programmes.

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APPENDIX A

Introduction Letter to Conduct a Survey by Universiti Utara Malaysia (UUM)

OTHMAN YEOP ABDULLAH GRADUATE SCHOOL OF BUSINESS
Universiti Utara Malaysia
06010 UUM SINTOK
KEDAH DARUL AMAN
MALAYSIA

UUM Universiti Utara Malaysia

Tel.: 604-928 7101/7113/7130
Faks (Fax): 604-928 7160
Laman Web (Web): www.oyagsb.uum.edu.my

"MUAFAKAT KEDAH"

UUM/OYAGSB/R-4/4/1
20 February 2018

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: DATA COLLECTION

This is to certify that the following is a postgraduate student of the Othman Yeop Abdullah Graduate School of Business, Universiti Utara Malaysia. He is currently enrolling the Doctor of Business Administration (DBA) programme. In fulfilment of the DBA degree, he is required to write a doctoral dissertation, which entails the data collection process.

No.	Name	Matric No.
1.	Sultan Saqar Oqaidah Al Wahaibi	902103

I write this letter to seek your kind assistance in providing him the necessary information to enable him to complete his dissertation. All information will be strictly used for academic purposes only.

Your help and support in this matter are very much appreciated.

Thank you.

KNOWLEDGE, VIRTUE, SERVICE

Yours faithfully,

ROZITA RAMLI
Assistant Registrar
For Dean
Othman Yeop Abdullah Graduate School of Business

c.c.   -   Student file (902103)

Universiti Pengurusan Terkemuka
The Eminent Management University

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APPENDIX B

Arabic Letter of Approval from Ministry of Education in Oman

الرقم ....
التاريخ .... هـ الموافق ......

سلطنة عُمان
وزارة التربية والتعليم

لمن يهمه الأمر

الموضوع/ الموافقة على تطبيق أدوات دراسة بحثية

نهديكم أطيب التحية، ويسرنا إفادتكم بموافقة وزارة التربية والتعليم على تطبيق أدوات الدراسة

المعنونة بـ " *تقييم جودة البرنامج التدريبي لمادة الرياضيات بالمعهد التخصصي لتدريب المعلمين*"

المقدمة من قبل الدارس **سلطان بن صقر الوهيبي**؛ اخصائي تقييم برامج تدريبية بالمعهد

التخصصي للتدريب المهني للمعلمين، وتم السماح له بتطبيق مقابلات على عينة من المعلمين

الملتحقين بالبرامج التدريبية في الفترتين الأولى والثانية من مختلف المحافظات التعليمية، وقد

أعطيت له هذه الرسالة بناء على رغبته دون تحمل الوزارة أية مسؤولية تجاه ذلك، وفي حالة وجود

أي استفسار لديكم نرجو تواصلكم مع دائرة الدراسات التربوية والتعاون الدولي على هاتف رقم

24255303 أو 24255134 أو على البريد الإلكتروني tosd@moe.om.

وتفضلوا بقبول فائق التقدير والاحترام،،،

دائرة الدراسات التربوية والتعاون الدولي

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APPENDIX C

List of Experts

No	Name	Qualification
1.	Dr. Abbas Ramdani	Ph.D. in Communication, Universiti Utara Malaysia, Malaysia.
2.	Dr. Amira Sulaiman Al Shabibi	Ph.D. in Education-TESOL, University of Leeds, UK.
3.	Bahia Abdullah Al Rashdi	Master in Measurement and Evaluation, Sultan Qaboos University, Oman.
4.	Dr. Khadija Darwish Al Blauhsi	Ph.D. in Education (Human Resources Development), University of Exeter, UK.
5.	Dr. Mahfoodh Al Bahri	Ph.D. in Education (Human Resources Development), University of Exeter, UK.
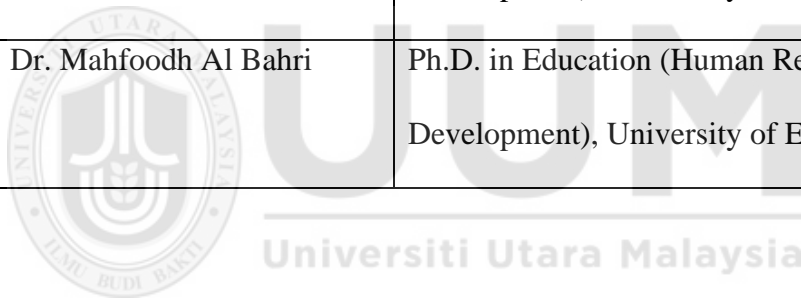
Initial draft of interview questions in pilot interview

Interview questions for mathematics trainee teachers at the Specialised Institute for Professional Training of Teachers in Oman

The researcher is conducting a study on evaluating the quality of mathematics teachers training programme in the Specialised Institute for Professional Training of Teachers in Oman. I appreciate your participation in this interview and I would like to emphasise that your views in this interview will be confidential and will not be used except for research purposes.

Time of interview:
Date:
Interviewer:
Interviewee:
A few preliminary questions

- Do you understand the objectives of the study?
- Are you happy with the recording of this interview?
- Do you have any concerns and interests you would like to raise?

Demographic

- *Can you tell me about yourself?*
  - Age
  - Gender
  - Years of teaching experience
  - Educational governorate

Interview questions:

1. Why did you participate in this programme?
2. What was your experience in this programme?
3. Do you think this programme has met your expectation? Why or why not?
4. What was the biggest takeaway of this programme for you? Why?
5. In your view, which aspect of this programme was most in need of improvement? Why?
6. Is there any comments relevant to what has been discussed before we end our meeting?

Thank you for your cooperation.

APPENDIX E

Arabic version of initial draft of interview questions in pilot interview

الأستاذ/ة المتدرب/ة ببرنامج خبراء الرياضيات بالمعهد التخصصي للتدريب المهني للمعلمين بسلطنة عمان المحترم،،

يقوم الباحث بإعداد أطروحة الدكتوراه حول تقويم جودة البرنامج التدريبي لمعلمي الرياضيات بالمعهد التخصصي للتدريب المهني للمعلمين بسلطنة عمان، وبما أنكم أحد ملتحقي هذا البرنامج؛ تم اختياركم كعينة للدراسة، فشكرا جزيلا على المشاركة في هذه المقابلة البحثية، وأود التأكيد على أنه سيتم التعامل مع إجاباتكم بسرية تامة ولن تستخدم إلا لغرض البحث العلمي.

وقت المقابلة:
التاريخ:
الباحث:
العينة:
أسئلة تمهيدية:

- هل هدف الدراسة واضح بالنسبة لك؟
- هل تسمح بتسجيل هذه المقابلة؟
- هل لديك أية ملاحظات تود تطرحها قبل بدء المقابلة؟

البيانات العامة:

- العمر:
- الجنس:
- الخبرة التدريسية:
- المحافظة التعليمية:

أسئلة المقابلة:

1- لماذا حضرت البرنامج التدريبي لخبراء الرياضيات بالمعهد التخصصي للتدريب المهني للمعلمين؟
2- كيف كانت تجربتك في هذا البرنامج التدريبي؟
3- برأيك، هل تعتقد بأن هذا البرنامج التدريبي لبى توقعاتك؟ لماذا أو لم لا؟
4- من وجهة نظرك، ما جوانب قوة هذا البرنامج التدريبي، ولماذا؟
5- من خلال تجربتك، ما جوانب التطوير التي يحتاجها هذا البرنامج التدريبي؟ ولماذا؟
6- هل لديك تعليقات إضافية قبل إنهاء المقابلة؟

انتهت الأسئلة
مقدرا لكم تعاونكم البناء،

Final draft of interview questions

Interview questions for mathematics trainee teachers at the Specialised Institute for Professional Training of Teachers in Oman

The researcher is conducting a study on evaluating the quality of mathematics teachers training programme in the Specialised Institute for Professional Training of Teachers in Oman. I appreciate your participation in this interview and I would like to emphasise that your views in this interview will be confidential and will not be used except for research purposes.

Time of interview:
Date:
Interviewer:
Interviewee:

A few preliminary questions
- Do you understand the objectives of the study?
- Are you happy with the recording this interview?
- Do you have any concerns and interests you would like to raise?

Demographic
- *Can you tell me about yourself?*
  - Age:
  - Gender:
  - Years of teaching experience:
  - Educational governorate:

Interview questions:
1. You are participating in the maths teacher training program at the SIPTT, why did you decide to take part in it?
2. Do you think the training programme fulfils your training needs? Why?
3. Were there any takeaways/benefits from the programme?
   - If yes, what?
   - If no, why not?
4. Did you face challenges in the program? Why?
5. Do you think the programme should be improved?
   - If yes, in what ways? What aspects of it needs improvement?
   - If no, are you happy with all aspects discussed throughout the programme? How?
6. Do you have anything else you would like to add about the maths teacher training programme?

Thank you for your cooperation.

Arabic version of final draft of interview questions

الأستاذ/ة المتدرب/ة ببرنامج خبراء الرياضيات بالمعهد التخصصي للتدريب المهني للمعلمين بسلطنة عمان المحترم،

يقوم الباحث إعداد أطروحة الدكتوراه حول تقويم جودة البرنامج التدريبي لمعلمي الرياضيات بالمعهد التخصصي للتدريب المهني للمعلمين بسلطنة عمان، وبما أنكم أحد ملتحقي هذا البرنامج؛ تم اختياركم كعينة للدراسة، فشكرا جزيلا على المشاركة في هذه المقابلة البحثية، وأود التأكيد على أنه سيتم التعامل مع إجاباتكم بسرية تامة ولن تستخدم إلا لغرض البحث العلمي.

وقت المقابلة:
التاريخ:
الباحث:
العينة:
أسئلة تمهيدية:

● هل هدف الدراسة واضح بالنسبة لك؟
● هل تسمح بتسجيل هذه المقابلة؟
● هل لديك أية ملاحظات تود تطرحها قبل بدء المقابلة؟

البيانات العامة:

– العمر:
– الجنس:
– الخبرة التدريسية:
– المحافظة التعليمية:

أسئلة المقابلة:

7- لماذا حضرت البرنامج التدريبي لخبراء الرياضيات بالمعهد التخصصي للتدريب المهني للمعلمين؟
8- برأيك، هل لبى البرنامج التدريبي توقعاتك؟ ولماذا؟
9- هل وجدت جوانب قوة لهذا البرنامج التدريبي:
- إذا نعم، ما هي؟
- إذا لا؟ لماذا؟
10- هل واجهتك تحديات في هذا البرنامج التدريبي؟ لماذا؟
11- من وجهة نظرك، هل يحتاج هذا البرنامج التدريبي للتطوير:
- إذا نعم، كيف؟ وما هي الجوانب التطويرية؟
- إذا لا؟ هل يعني ذلك أنك راض عن كل الجوانب في هذا البرنامج؟ كيف؟
12- هل لديك تعليقات إضافية فيما يتعلق بهذا البرنامج؟

انتهت الأسئلة
مقدرا لكم تعاونكم البناء

APPENDIX H

Extracted interview transcript of strengths of mathematics teachers training at the SIPTT

Theme	Sub-themes	Code	Data
Context	Supportive Workplace environment	Peer support	Info4: "I knew the training programme from my colleague (a former trainee in the first batch) because some tasks required to be accomplished in the programme were colleagues' participation in some training tasks to exchange experiences. I was with her as a cooperating colleague during the completion of her required tasks (such as photographing the required applied lessons)." Info5: "I knew the programme through the non-trained senior mathematics teacher and principal who nominated and encouraged me to attend the programme." Info6: "Graduate trainee's practices influenced me to join the program." Info10: "Previous trainees encouraged me to join the program to learn about modern teaching methods, refine skills, apply strategies and employ technology in teaching." Info11: "...trainees in the school previously enrolled in the training programme encouraged me to join. They played a significant role in motivating me to participate. The senior mathematics teacher who was a former trainee in the programme partially transferred the training." Info12: "The graduate trainees had a significant role in encouraging me to attend the program." Info14: "One of my colleagues is always motivated and strives for change. She is a trainee in another training program. She mentioned that she enjoyed and benefited from the program a lot. She motivated me to enrol." Info15:"Graduate trainee convinced me to join the program."

Theme	Sub-themes	Code	Data
		Principal support	Info5: "I knew the programme through the non-trained senior mathematics teacher and principal who nominated and encouraged me to attend the programme."
			Info8: "The principal had a significant role in encouraging me to enrol in the programme."
			Info13: "Principal encouraged me, so I agreed to join the program."
	Professional learning communities.	Conducting workshops	Info4: "I presented a workshop for my fellow teachers in the school, such as problem-solving teaching strategies in mathematics. The impression of participants was wonderful, as I relied on the participation of trainees."
			Info10: "I had conducted practical workshops in school about how to implement the teaching strategies that we had previously trained on in the program."
		Sharing experience	Info4: "The training programme facilitated exchanging trainee teachers' experiences in the same field of specialisation."
			Info11: "We benefited from exchanging experiences with other trainees who enrolled in the training program from different educational governorates."
			Info13: "The presence of trainees from the various governorates of the Sultanate and benefiting from their experiences because the teaching conditions in the regions differ from one region to another due to the difference in the local culture/teaching methods available, schools' needs and the local environment."
			Info14: "The second advantage is to exchange experiences with trained teachers who came from different regions of the country. It is an opportunity to get acquainted with how the lessons are presented, the alternatives and options available, and the difficulties teachers face while teaching."
			Info14: "The training program enhances teacher's confidence to express and discuss his views and training method that encouraged the trainee to share his experiences."
			Info14: " ….meeting with colleagues from different educational regions."
			Info15: "One of the advantages of implementing workplace tasks is transferring training experience to colleagues in the school."

Theme	Sub-themes	Code	Data
		Transfer knowledge to non-trained teachers	Info15: "I explained some points that I had trained on to non-trained colleagues—for instance, explaining specific electronic programs, using educational research related to teaching mathematics, explaining action research steps, referring to previous studies of superior education studies, and using modern technology in teaching."
		Professional discussion	Info10: "Some of the advantages of the programme are; first, discussion with trainee teachers on implementing the required tasks, discussion and dialogue in the educational platform, exchanging experiences between teachers enrolled in the programme."
			Info13: "I like the discussion about teaching experiences with colleagues enrolled in the training program, especially in the first training period."
Administration	Policies and procedures	SIPTT briefing	Info5: " …after taking a brief overview of the training program, I agreed to participate. When the training program objectives were well clarified for the teachers, they expressed their enthusiasm to compete in joining the training program."
			Info8: "In fact, when we received the circular from the Specialised Institute that explains the training goals to increase teachers' expertise and skills in educational practices. So, that convinced me to join."
		One-day release.	Info11: "One of the programme's advantages is that SIPTT provides trainees one-day exemption from work duties to accomplish the training tasks."
			Info14: "in my opinion, the day of release from school duties is more realistic and convincing another mathematics teacher to join and will increase publicising the SIPTT training programs."
Input	Training design	Unique design	Info5: "It was a new and different design from previous training programs in the governorate training centres."
			Info8: "SIPTT training goals are to increase teachers' expertise and skills in educational practices. Therefore, that convinced me to join, especially the training courses and workshops conducted last time in the educational governorates were all routine, and their usefulness was barely mentioned. So, I consider this programme as one of the reasons for improving the educational level to a higher one."

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Theme	Sub-themes	Code	Data
			Info12: "We were not used to attending such a practical training programme. It was interesting. It encouraged us to complete the programme…We enjoyed attending the programme. We noticed that this training programme is positively different from the previous educational training."
			Info14: "In fact, we were attending training workshops in the governorate training centre, whose benefit was limited in terms of educational developments…but this programme was totally different"
		Practical design	Info4: "Advantages of the workplace tasks applications component; it was varied and directly related to our duties.
			Info5: "…trainee colleagues are cooperative. The point that motivated me the most was trainees' presence with less practical experience than me in terms of the number of years, but their performance in the training room was distinguished. One of the things that I liked about training was the face-to-face interaction of trainees in the training room."
			Info10: "The program design concentrated on implementing strategies and conducting action research."
			Info11: "The teaching strategies that we studied in the college are theoretical. When we saw new practical teaching methods applied by previous trainees, we joined the program to change our routine teaching practices."
			Info12: "Moving to the SIPTT in Muscat gives the trainee motivation to attend. It is something different from attending training programmes in the same area. This programme is one of the best training programmes in MOE. It helps teachers excellently."
			Info12: "The first semester was something new for us. We are not used to attending such a practical training program. It was interesting."
			Info14: "The third point is the practical application of the training content. The training content begins with the theoretical part and then directly the practical applications to consolidate the information."

Theme	Sub-themes	Code	Data
		Training period	Info12: "The training programme has sufficient time to implement and practise. The two-year training programme strengthens the training information and skills."
	Training content	Combination of theory and practice	Info6: "integrating theoretical with applied aspects that match student reality." Info10: "The training content is a sequence and adequately studied, such as the theoretical and practical side. The programme design concentrated on implementing strategies and conducting action research."
		Foreign teaching practices	Info4: "We studied at SIPTT a set of themes, including foreign educational experiences." Info6: "I also got acquainted with the experiences of some educationally advanced countries." Info7: "We gained some educational strategies from developed educational countries such as Singapore, Finland, and South Korea." Info9: "We are learning about the best teaching experiences of many educational developed countries such as Finland." Info11: "The training content presented best practices in educational developed countries experiences and how to benefit from those experiences and adapt them in Omani schools." Info15: "Graduate trainee informed me that SIPTT has a great potential to qualify the teacher in gaining experience teaching mathematics, especially international experiences in education (such as Finland, Korea, and Singapore)."
		Compatible content.	Info4: "We knew the teaching of mathematics in a realistic context and reflections on educational practices, the skills of mathematical communication and learning by projects all of these were strong themes that I benefited." Info8: "During the first year, I benefited from the training content. It refined my cognitive and practical practices." Info14: "The application of workplace tasks was fascinating. I liked this part of the training because I practised most of the strategies that I trained on in the classroom environment."
		Helpful content	Info7: "The training content is helpful. It includes some modern teaching strategies (for example, brainstorming strategy."

Theme	Sub-themes	Code	Data
		Useful materials	Info4: "The educational platform in the online training helped me as well. It contained enriching materials. I used some to summarise mathematics lessons. Also, I benefited from it in carrying out some workshops for my colleagues on how to implement some teaching strategies (such as learning by playing, problem-solving, and active learning)." Info6: "In addition to the practical guideline involved in the training material for implementing it in the classroom." Info8: "Excellent training materials that enriched my knowledge and skill outcome."
		Training activities	Info5: "the strength of mathematics training is the availability of exciting training activities that attract trainees."
		Professional standard for Omani teachers	Info4: "…we studied at SIPTT a set of themes, including…professional standards for teachers in the Sultanate of Oman."
	Facilities	SIPTT training environment	Info9: "The SIPTT environment was convenient for training." Info12: "Moving to the training headquarters in Muscat gives the trainee motivation to attend. It is a different environment from attending training programs in the same area. Info15: "In general, the training environment at SIPTT was excellent."
		Training aids	Info15: "The training aids are available."
		Services	Info10: "The SIPTT services in accommodation and training facilities were satisfied." Info15: "One of the advantages is that services provided by the Specialised Institute are good."
		Training rooms	Info5: "We found the training rooms arranged and equipped." Info11: "The training room was equipped with specific training facilities. It was comfortable and well-prepared." Info15: "Face-to-face training is excellent in terms of preparing the training rooms."
	Trainer competencies	Specialised trainer	Info10: "… The programme exceeded my expectations. One of the reasons is the presence of highly qualified trainers of the same speciality…."

Theme	Sub-themes	Code	Data
			Info14: "The trainer was outstanding. He has the necessary scientific knowledge and skills."
		Qualified trainer	Info8: "Trainers have competencies and experience."
			Info11: "The trainer was creative and highly qualified. He had a significant role in encouraging and motivating us to complete the training program."
			Info14: "The trainer managed the program time properly."
			Info14: " …third, the distinguished trainer benefited us greatly."
			Info15: "The distinguished trainers from whom we gained various experiences."
		Inspiring trainer	Info14: "The trainers' character was inspiring."
	Trainee characteristics	Openness for change	Info11: "…our need for a change in teaching methods. The teaching strategies that we studied in the college are theoretical. When we saw new practical teaching methods applied by previous trainees, we joined the program to change our routine teaching practices..."
			Info12: "…among the positives is attending the program as a kind of change for us."
			Info13: "The reason to join that the desire to update and change some teaching practices."
			Info14: "…I want to change the teaching methods and remember the basis of teaching knowledge and skills. I felt a necessity to join the program to develop professional behaviours, assess student learning, etc. I think, my implementation of some strategies is incorrect"
		Self-motivation	Info12: "I intend to re-join the training program soon."
			Info13: "When I heard about the program, I was very encouraged to learn new things."
			Info14: "I felt a necessity to join the program to develop professional practices. I must update my knowledge."
		Self-improvement	Info7: "It was good to acquire new skills and new strategies such as (active learning, brainstorming - problem-solving) because we studied traditional education strategies in the college. So, we as senior teachers must know the developments of teaching strategies because new teachers may be aware of them. We must keep up updated."

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Theme	Sub-themes	Code	Data
Process	Training delivery	Good interaction	Info5: "One of the things that I liked about training was the face-to-face interaction of trainees in the training room."
			Info5: " …efficient trainer who positively attracts the trainees' attention."
			Info11: "The trainer discussed us well in face-to-face training. We benefited from his experiences."
			Info14: "Face-to-face component is excellent due to direct dialogue between trainer and trainees."
		Cooperation	Info5: "Trainee colleagues are cooperative when doing group activities in the training classroom."
		Trainer presentation style	Info14: "Honestly, the trainer's delivery style encouraged me to proceed with the training programme. If I were with another trainer, I would hesitate to complete the programme."
			Info14: "Frankly, I was impressed with his presentation style, providing information, and encouraging the trainees."
			Info14: "The trainer excellently explained each topic."
	Trainer follow-up and feedback.	Trainer's supervision	Info10: "I did not have sufficient experience in conducting research, statistics and analysis. However, I overcame all that with the trainer's help."
			Info10: "…continuous communication with the trainer, providing support and assistance during the implementation of the training tasks in the work environment and discussing the workplace's challenges… I did not have sufficient experience in conducting action research. However, I overcame all that with the trainer's help."
		Trainer encouragement	Info5: "The trainer was trying to convince me about the usefulness of action research."
			Info9: "The trainer encouraged me to acquire many modern strategies and educational values."
			Info11: "The trainer had a significant role in encouraging and motivating us to complete the training program."
			Info14: "The trainer was continuously encouraging us."

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Theme	Sub-themes	Code	Data
			Info14: "…the trainer benefited us greatly. His encouragement and continuous support helped us to overcome the difficulties. He often replies to the e-mail or answers the phone."
Outcomes	Trainee satisfaction	Expectations fulfillment	Info4: "The programme fulfilled my expectations in terms of its usefulness for my personal development."
			Info10: "The program exceeded my expectations…I was hoping that the program would last longer."
			Info14: "Personally, it fulfilled what I expected."
			Info15: "It met my training needs, especially in developing teaching methods."
		Valuable experience	Info4: "The experience was enriching, especially face-to-face training and workplace tasks application."
			Info4: "Actually, the programme was wonderful and valuable in the educational classroom environment."
			Info5: "It was a beneficial experience."
			Info6: "I gained a lot. It was an excellent experience that changed my thinking."
			Info9: "The experience of the mathematics training was good."
			Info10: "Indeed, it is a successful experience."
			Info11: "Frankly, it was a valuable programme."
		Recommended programme	Info5: "Honestly, I encourage other teachers to join this training program."
			Info8: "I consider this program as one of the reasons for improving the educational level to a higher one."
			Info8: "Such a training program we really miss."
			Info12: "…that achievement makes me enjoy the program."
			Info12: "…this programme is one of the best training programmes in MOE. It helps the teacher excellently."
		Interesting programme	Info12: "All in all, the program was interesting."
			Info12: "We enjoyed attending the programme."

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Theme	Sub-themes	Code	Data
	Teacher skillset	Reflection skill	Info4: "... how I can develop my skills in the learning process through reflections, where the teacher stands in the position of improvement and development of his skills through these reflections on educational practices."
		Self-evaluation skill	Info4: "After the programme, I felt that I was an energetic teacher in the school. I also felt that I absorbed the training topics."
			Info7: "Applying training tasks and video-taping them was something new and enriching my performance evaluation."
			Info14: "The programme revealed my strengths and weaknesses. I knew exactly where the needs are in my career – what are the things that I have the strength in and can be further developed."
		Self-learning skill	Info13: "The program increased teachers' learning efficiency in light of knowing the changes that the world is witnessing in the educational field."
			Info15: "I gained the importance of knowing about global experiences in education. Also, how to benefit from educational books and articles interested in this field."
		Self-appreciation	Info10: "I had conducted practical workshops on implementing the teaching strategies that we had previously trained on in the programme. I considered it an outstanding achievement for me."
		Guidance	Info4: "It made the teacher active, distinguished and a guide for his peers in the school."
			Info10: "I noticed myself as a guide for some non-trained teachers on implementing some strategies and designing teaching aids."
		Teacher performance	Info4: "I saw the programme's impact and how my colleague improved…. I felt that this training programme focused in-depth on the mathematics subject itself, which is better because it serves the learning environment's educational process."
			Info5: "…after implementing the strategies that we trained on, we became more directed to the educational process that increased our performance."

Theme	Sub-themes	Code	Data
			Info6: "When I returned from the Specialised Institute, I tried these strategies in the classroom. I felt a big difference. I noticed a better level and a big difference from my previous performance."
			Info8: "The program developed my knowledge and practical skills."
			Info9: "It contributed to refining my skills. Also, it added a lot to my knowledge. My outlook for modernisation and development in teaching became distinct."
			Info12: "The programme helped the teacher excellently."
		Teaching skill	Info4: "Applying methods of dealing with mathematical problems and problem-solving strategies more than in a traditional way."
			Info5: "We can explain mathematics to students in an exciting way that increases their understanding."
			Info6: "I gained new methods and strategies for active learning."
			Info6: "I learnt what is new in educational practices, besides changing the pattern of mathematics teaching strategies, from traditional ways to active learning."
			Info7: "I liked many things in the training program, such as new mathematics teaching strategies (active learning, brainstorming, and problem-solving)."
			Info8: "…because of this programme, I mastered many modern teaching methods."
			Info9: "I acquired modern teaching strategies for example, active learning strategy, flipped classroom strategy, and project learning."
			Info10: "I gained modern teaching methods and strategies."
			Info10: "I utilised the new skills that I trained on (such as twenty-first-century skills) in the classroom."
			Info11: "We also learned about the twenty-first-century skills that we did not address in teaching strategies previously."
			Info12: "We learned new strategies in teaching mathematics."
			Info13: "I applied the updated mathematics teaching strategies to convert mathematics subject into an enjoyable one."

Theme	Sub-themes	Code	Data
		Technology skill	Info14: "The training program allowed me to change my teaching strategies."
			Info15: "I gained updated mathematics teaching strategies."
			Info8: "I mastered many modern teaching methods, such as teaching strategies using technology in the classroom."
			Info10: " As a result, I employed technology in teaching"
			Info10: "We learnt how to use technology in mathematics teaching."
			Info13: "… we use technology in education in order to increase student motivation towards e-learning and self-learning in general and technology related to mathematics subject."
			Info13: "The programme teaches how to use technology in mathematics teaching."
			Info14: "The fourth point is the training program included using technology in teaching."
			Info15: "The SIPTT helped me to use effectively educational aids, for example, technology."
			Info15: "I explained some points that I had trained on to non-trained colleagues—for instance, explaining specific electronic programs and using modern technology in teaching."
		Classroom management skill	Info5: "we learned how to deal with the student professionally (such as classroom management)."
			Info8: "One of the advantages of the programme is acquiring the skill of successful classroom management."
		Production of educational aids	Info6: "The training programme facilitates us to create educational aids on the mathematics teachers training outcomes. We are trained to create exciting and inexpensive educational aids innovatively."
			Info10: "We designed innovative and inexpensive educational aids."
			Info15: "This program helped me to create and use educational aids (whether through electronic programs or traditional such as blackboards and slides)."
			Info15: "…the production of educational aids for teaching sessions was created by trainee teachers or produced by students under trainee teachers' supervision. Previously we relied only on pre-prepared educational aids from the ministry or educational governorates."

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Theme	Sub-themes	Code	Data
		Student learning assessment	Info6: "I applied new assessment methods for student learning. It helped me more in understanding to what extent students learned."
			Info6: "The information is more entrenched and gaining assessment strategies that differ from the assessment methods that we used in the school previously."
			Info8: "There are many strengths such as acquiring the skill of the optimal use of student assessments strategies."
			Info9: "We gained new strategies in how to deal with the individual differences of the students."
		Teacher performance (it is better to move here due to its logical sequence.	
	Teacher productivity	Teacher-student relationship	Info5: "I was surprised when students I taught last year informed the school principal of their desire to teach them again that is evidence of the impact of applying these strategies on students learning."
			Info14: "The student became more engaged to the class."
		Student motivation	Info4: "linking the lesson to the student's life. The more the link increased, the student became more attached to the subject and knew its importance. I am still practicing such strategies."
			Info5: "I noticed students' attractiveness increased for the subject due to our application of entertaining teaching strategies. Hence, the mathematics subject turned from a purely rigid subject into an interesting subject for students."
			Info6: "I observed improvement in students' achievement, for example, in terms of comprehension in the class and the motivation to learn."

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Theme	Sub-themes	Code	Data
		Student participation	Info10: "Students insisted on using such strategies that we trained on, such as play-learning and cooperative learning—students in some lessons divided into groups before the teacher arrives in the classroom." Info11: "We noticed an increase in students' motivation to participate. As you know, mathematics is a purely scientific subject. After we applied those strategies, the subject became more attractive for students and increased their motivation to learn." Info5: "One of the positive outcomes of the training program is that we can convert mathematics from a purely scientific subject to an exciting subject for students because of those strategies implemented after a training program. Info6: "Active learning strategies make the student constantly participating in the class and attracted to learning." Info12: "The students also benefited from active learning. Students' participation in the classroom increased due to teachers' application of such strategies."
		Student achievement	Info6: "That improves student achievement because of the practical application of what we trained." Info6:" I observed improvement in students' achievement, for example, in terms of comprehension in the class and the motivation to learn." Info7: "It helped me a lot, especially in the improvement of student achievement." Info7: "The result was actually positive on students learning." Info8: "I mastered many modern teaching methods such as teaching strategies using technology in the classroom. It had a significant impact on the students' achievement." Info9: "I applied modern teaching strategies, for example, active learning strategy, flipped classroom strategy, and project learning. It helps me raise the achievement level of students in mathematics subject." Info10: "Students insisted on using strategies that we trained on, such as play-learning and cooperative learning—students in some lessons divided into groups before the teacher arrives in the classroom. I have noticed a gradual improvement in student achievement."

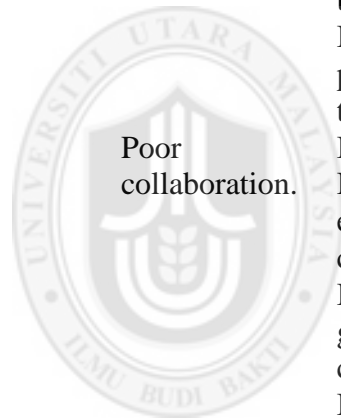| Theme	Sub-themes	Code	Data
	Research skills	Action research	Info12: "The students also positively benefited from it." Info9: " Among the programmes' strength is knowing how to conduct action research." Info10: "The programme helped develop the teacher's skills. For example, research skill, the trainee was able to identify the problem he faces in the school and analyse it to find a solution." Info10: "I learnt how to conduct action research." Info10: "The programme helped develop the teacher's skills. For example, research skill, the trainee was able to identify the problem he faces in the school and analyse it to find a solution." Info11: "I can say that the mathematics training program improved my skills and knowledge, especially, in developing research skills." Info14: "The training program included the basics of scientific research." Info15: "I explained some points that I had trained on to non-trained colleagues—for instance, using educational research related to teaching mathematics and explaining action research steps."

Extracted interview transcript of weaknesses of mathematics teachers training at the SIPTT.

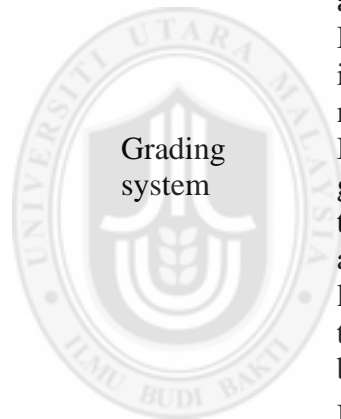| Themes	Sub-themes	Code	Data
Context	Misalignment of content to Omani classrooms	Mismatch of some lesson plans Unfit foreign models.	Info4: "Some lesson plans in the training contents are different from lesson plans that the mathematics teacher practices daily. That confuses the trained teacher, and indeed - personally - I did not take advantage of it because it was not related to my daily work Info7: "The use of educational models in the training material from foreign countries differs from Omani students' culture. Indeed, most of the students in those countries are prepared, and their conditions are entirely different from the conditions of the Sultanate's school students." Info13: "In fact, teachers are more knowledgeable in the field than the training designer who prepared the training content, which may be far from the context of Omani schools. Because the educational system in foreign countries and society's culture is different from local context." Info14: "I noticed that the content presented in the online training included foreign teaching experiences, there was no link to the local context. It is not suitable for Oman society."
Administration	Policies and procedures	One-day release policy.	Info7: "Although the trainee gets one day off a week to implement training tasks, they were not benefiting from it due to workload." Info8: "MOE gives trainees one-day release per week to carry out training tasks in the training program with re-allocating the rations for that day to the days of the week. That issue created a problem for me with lots of classes, mainly classes of up to 21. Thus with re-distributing it over four days, it became a heavy burden on me." Info13: "One of the reasons for the withdrawal is … classes accumulate due to the release of one day a week from work duties to do training tasks. Hence, it is not easy to finish the curriculum according to the specified period."

Themes	Sub-themes	Code	Data
		Timing of face-to-face training	Info4: "The disadvantage of face-to-face training is timing. It is not suitable because it causes missing some lessons when the trainee teacher attends face-to-face training sessions at the Specialised Institute for a whole week in a semester. Consequently, a trainee teacher must replace these classes. So, the trainee teacher becomes worried about not completing the mathematics curriculum at the specified time."
			Info4: "Some difficulties face the trainee. For example, attending one-week face-to-face training each semester at the Specialised Institute in Muscat leads to missing some classes for a whole week in the semester (21 classes per week on average). Thus the trainee is forced to replace them later, which causes more workload besides additional workloads and tasks at the school. Therefore, there was a great challenge. It was not easy. Some of my colleagues had a more complex situation due to having many different classes. This point is critical."
			Info11: "The timing of face-to-face training is not suitable for some trainees. If he attends the program, the trainee may face difficulty in completing the tasks on time. Subsequently, he withdraws from the program."
			Info14: "Trainees missed many classes (most of the mathematics teacher has 21 classes per week), because of attending the week of face-to-face training each semester. As a result, they should replace it later. That means more workload."
			Info14: "In fact, mathematics is a heavy scientific subject that needs many classes. The math teacher misses a whole week's classes due to attending face-to-face training at the SIPTT. Missing this number of lessons is not a simple thing. Consequently, the mathematics teacher must replace these classes—besides other schoolwork responsibilities and duties. Consequently, we faced much difficulty and pressure from work, which affected the delay in implementing the tasks and the delay in teaching the curriculum for the specified period. Therefore, we had to take additional classes."
			Info14: "But I think that the face-to-face training time is limited, so the trainer is forced to cut short training content."

Themes	Sub-themes	Code	Data
		Vague selection	Info5: "Among the program's weaknesses is the random selection by school principals of the mathematics teachers who nominated them to attend the program. Therefore, some of these trainees withdrew from the program directly due to a lack of seriousness or motivation. Also, some teachers enrolled in a mathematics training program based on principals' requests. Then the trainee withdrew due to his lack of conviction of the benefit of the program. So, the rest colleagues who had eager to register in the program have lost the opportunity to attend."
			Info5: "Personally, I know three colleagues who enrolled –forcibly- into the training program. Then, they withdrew just after one week. Thus, the opportunity missed some teachers who had a severe desire to attend the program."
		Poor collaboration.	Info4: "We miss a coordination between the SIPTT and the school."
			Info6: "Sometimes, I feel there is no coordination between the school administration, educational governorates, and the SIPTT. For example, the administration does not consider the high quantity of mathematics classes for trainees.
			Info6: "Sometimes I feel no coordination between the school administration, educational governorates, and the Specialised Institute. For example, the administration does not consider the high quantity of mathematics classes for trainee teachers."
			Info6: "In my view, reasons for dropping out of the training program that related to work, such as the high quantity of classes for mathematics teachers (21 classes out of 40). Additionally, other school work and training tasks are required. Therefore, the trainee cannot complete those tasks on time."
			Info8: "In the second year, I faced many challenges at school that made it difficult to continue in the program. I withdrew from the program due to poor coordination between the Ministry of Education and Muscat educational governorate."
			Info8: "I also faced a lack of acceptance from the school administration with conducting training workshops for my fellow teachers and transferring the programme's experience to

Themes	Sub-themes	Code	Data
			them so that the benefit is widespread for all. That is because the ministry did not put in place regulations that serve the training transfer process."
			Info11: "There is no collaboration between the school administration and the SIPTT based on giving trainee teachers fewer mathematics classes than non-trained teachers. That is a huge workload. The trainee teacher, for example, has 21 classes within four days, i.e. an average of 5 classes per day. Then, on the fifth day, he implements the training tasks and assignments."
			Info14: "Unfortunately, I could not apply such strategies again due to limited time. Because if I apply all the strategies that I have been trained on, I will face problems completing the mathematics curriculum. MOE should consider teacher workload"
		Grading system	Info4: "Another point is the lack of grading system for trainees' results (excellent - very good - good - acceptable - weak - fail). Still, the results are limited to (pass/ fail). Thus, all trainees are equal in passing, meaning that they are similar in their results. So, the trainee aims to reach the point of a passing grade. Therefore, he implements the required only. The lack of differentiation of grading negatively affects trainees' motivation. We have the right to ask for distinguishing the results! How can those who work hard, diligently and sincerely be equal with those who only do what is required!"
			Info11: "lack of objectivity in grading the required tasks, whether in answering questions on the electronic platform in the online training component or applying the action research."
		Training certificate.	Info4: "I considered joining this training programme as an opportunity for professional development and an alternative to studying for a master's degree…I hope that the training programme certificate would be equivalent to a master's degree if another semester were added to the programme. The certificate made us disappointed."

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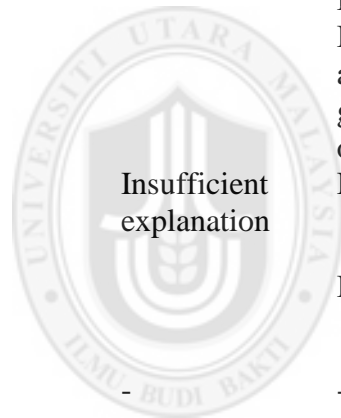| Themes	Sub-themes	Code	Data
			Info11: "The lack of clarity of the certificate's value provided by the SIPTT and the extent of its usefulness to the trainees' career path. The trainee spends two years in the training program and then obtains a certificate in some teachers' view that has no value to his/her career!"
			Info13: "the vision is not clear to the trainees of the training program's value in their career."
			Info13: "The certificate offered to the graduate of the program has no value in teachers' career."
			Info14: "Certification is also an essential factor in attracting trainees. When we saw that the certificate is a diploma and has no real value in our career, we were incredibly frustrated."
Input	Training design	Challenging requirement	Info7: "In fact, among the reasons for withdrawal are many works and tasks required in the program."
			Info12: "I did not understand the training program design and method. Therefore, I did not deliver the required tasks because I am not accustomed to such programs. It is true, it is a new idea, but it is not understood. I found it difficult, so I did not complete the training program."
			Info13: "Some of trainees prefer not to implement the required tasks and therefore not pass the training period or withdraw from the program."
			Info14: "The academic writing rules that we studied at the bachelor's stage is simple. How is the research problem formulated, how do we extract it, and how do we choose the research sample. Therefore, when implementing the action research task, we encountered a difficult time despite the training content's instructions."
			Info15: "In regard to online training, after completing the face-to-face training day, the trainer asked the trainees in the evening to submit the online assignment. That is difficult because of the short time due to the existence of family and social responsibilities."

Themes	Sub-themes	Code	Data
	Training content	Compulsory tasks	Info5: "Compulsory action research task is considered as a hindrance to joining the program."
			Info5: "In fact, many colleagues withdrew because of an action research assignment."
			Info10: "After the end of the program in the first batch, the reactions of the trainees differed. Some of them withdrew from the program, and some discouraged others due to many compulsory training tasks."
			Info10: "Mandatory tasks are considered a hindrance for the teachers to join the training program."
			Info11: "The second challenge is the training tasks required to pass the training program. Trainees must write action research consisting of 5000 words. That was a great challenge, especially for those who have no writing research background. This matter is considered a real challenge, especially since this is a compulsory requirement to pass the training program as well as the activities on the platform."
			Info12: "At the end of each module, the trainee feels imposed to submit many tasks."
			Info12: "I had difficulty implementing those tasks properly. In theory, I see it as simple and easy, but we have difficulty to get enough time to implementing it."
			Info12: "Personally, I considered the difficulty of carrying out the tasks as one of the training program's challenges."
			Info15: "In regard to workplace tasks application, I consider it the biggest weakness in the training program. Although it helped us, these tasks are obligatory to be applied in the classroom environment. This obligation is a concern for me."
			Info15: "Why this program imposes trainees to write a paper that has many requirements in terms of word count, formatting, documentation, etc.). Honestly, I did not do that. That task is similar to a master's thesis. We must write each point and attach evidence (pictures, videos etc.). There is no need for all of this. In my opinion, this is one of the biggest reasons why some trainees do not complete the program, or some teachers do not want to join the program. This is what my colleagues told me."

Themes	Sub-themes	Code	Data
		Numerous training tasks	Info4: "In my view, the reason for withdrawal is the enormous burden of the mathematics teacher duties and responsibilities (such as teaching besides other school tasks) and the inability to balance between handing over numerous tasks required to pass the program and completing school tasks at the same time.
			Info4: "Challenge of workplace tasks application: the tasks required to pass the program formed the trainee teacher's workload."
			Info11: "Trainees face many challenges: the biggest one is that the trainee teacher has many mathematics classes—besides, too many training tasks. Frankly, the school administration does not take into account these aspects. That is a really huge workload."
			Info14: "Implementing the tasks was limited because it requires more time to prepare and organise the applied tasks, especially with the high quantity of mathematics classes. With many mathematics classes, it is not easy to find time to implement all of these tasks."
		Imbalance content.	Info4: "For the second batch of the training program, there was a kind of confusion. There is no balance between the four training modules in each module's training contents' intensity, besides, some repetition" Info13: "In the second year, I noticed the training content's repetition which frustrated my interest and motivation for the training program."
		Poor teaching apps	Info6: "There is a lack of focusing on online training content. It should include programs/applications/software that can be used in e-learning in the training material. It will enrich the training program."

Themes	Sub-themes	Code	Data
			Info11: "Before joining the program, I expect to learn something new about mathematics applications (such as Geogebra and Photomath). These programs help teach the subject (for example, in teaching geometry, mathematical equations etc.). I expected that there would be an in-depth in such software. Unfortunately, we did not get what we hoped. Despite the availability of methods and strategies for teaching mathematics in the training content, but this is not all that we expected."
			Info13: "The training program was not in-depth in terms of mathematics teaching apps."
			Info15: "There are few weaknesses, such as a brief explanation of some teaching applications and websites, for example, (Shamaa) research database website. We were given a short opportunity to implement them. Therefore, we did not have enough opportunity to understand how to use them accurately."
		Insufficient explanation	Info14: "The action research task has an insufficient explanation. It was a brief."
			Info14: "We were trained on research basics in the SIPTT, but I think that it is not enough."
	Training facilities	-	-
	Trainer competencies	Poor supervision.	Info13: "Sometimes, the trainer did not provide support and follow up. At the beginning of the program, I was motivated by the program. Then, I become discouraged because the trainer did not guide me properly."
	Trainee characteristics	Lack of research interest.	Info5: "I do not want to do action research. It is better for there to be few practical tasks so trainees can apply them continuously, rather than assigning them many tasks that they may do to pass the training program and then stop using them. Therefore, they will not get benefit from their daily professional practices in the long term."

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Themes	Sub-themes	Code	Data
			Info5: "I asked a fellow trainee in the program later and complained about the action research task. It is a mandatory task in the training program. True, we joined the training program on the basis that we are developing our skills. Still, we want to improve skills related to the classroom environment and mathematics teaching strategies, why I must do action research and apply its steps! (Such as defining the problem, searching about its evidence, previous studies related, appropriate solutions proposed and analysing the research results). I do not have time to do all that."
			Info5: "The trainees do not prefer it due to a lack of previous background or unwillingness to do so."
			Info5: "In my opinion, research is considered a theoretical and impractical thing."
			Info14: "When we introduce the training program to encourage teachers and contain such-and-such, they are encouraged, but when action research is mentioned, they hesitate to join the program. That is because most teachers are not familiar with the basics of action research."
			Info14: "I noticed that most of the teachers do not have sufficient knowledge about scientific research due their unwillingness to do it"
			Info14: "It is possible - some - do not have the desire to write the required research or did not find enough time to submit it. Submission of action research is a prerequisite for passing the training program. Therefore, because of that, some trainee withdrew from the program. The rest of the applied tasks could implement and deliver, but the research posed an obstacle for some."
			Info15: "Honestly, I do not do the action research task." That is why I do not pass the programme."
Process	Training delivery	Unsatisfactory participation	Info14: "In my opinion, online training did not achieve its goal, unlike face-to-face training and the application of workplace tasks."

Themes	Sub-themes	Code	Data
		in online training.	Info14: "Online training did not have a significant impact like face-to-face training. We just read and complete the exercises and participate in the forum. In my opinion, it was not a strong point for the program.
		Technical issues.	Info4: "Educational platform faced many technical problems" Info12: "In online training, sometimes, I got difficulty accessing the platform." Info14:"We struggled with online training because of its technical issues."
		Poor online discussion	Info4: "Discussions on the platform - in my opinion - are useless and unproductive due to the lack of participation of the trainees or not activating them correctly. That may be due to technical problems as well." Info14: "Discussions between the trainees were not beneficial. Because of the lack of participation and the lack of interaction of some, and in my opinion, it did not achieve its goal."
		Theoretical online tasks.	Info15: "Online training benefited us, but it did not up to the desired level. We gave some theoretical activities as homework, and this method did not satisfy me, as we are not students who should do homework." Info11: "….the theoretical activities on the platform must be completed in a limited time."
	Trainer's follow up and feedback	-	-
Outcomes	Withdrawal/fail/ not register in the program.	Reasons	Failing, withdrawal, or not registering in the programme due to: - Compulsory action research task. - Increasing school workload because of the training programme. - Inappropriate timing for face-to-face training. - Vague value of training certificate on teacher's career path.

APPENDIX J

Extracted interview transcript of recommendations to improve the quality of mathematics teachers training at the SIPTT.

Themes	Sub-themes	Code	Data
Context	Working environment culture.	School administration support	Info8: "I tried in various ways to persuade the school administration and Muscat Educational governorate to find a solution. Unfortunately, I did not receive any response. I also faced the school administration's lack of acceptance of training workshops for my fellow teachers and transferring the program's experience."
		Omani teaching models	Info7: "It is better to use educational models from Omani schools, so the trainee will be encouraged to apply them." Info9: "I would like to see more of the distinguished Omani teaching experiences instead of foreign teaching models." Info13: "The training content must touch the reality of schools in the Sultanate and not just a theory. Therefore, the trainee wants to take from the training program what is compatible with the reality of the educational and classroom environment in the Sultanate's schools. In fact, teachers are more knowledgeable in the field than the training designer who prepared the training content, which may be far from the context of Omani schools. Because the educational system in these countries and society's culture are different from local contexts. Therefore, the presentation of a video of an application lesson for one of the strategies of teaching mathematics in these countries is perhaps not suitable for presenting it in the training content and forcing the trainee to apply it in the classroom. If the example of an applied lesson were in the Sultanate, it would have been more helpful, valuable and convincing." Info14: "I suggested changing the educational platform or how the training content is presented or linking it more to the Omani curriculum because I noticed that the content

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Themes	Sub-themes	Code	Data
			presented in the online training included foreign teaching experiences. There was no link to the local context. It is not suitable for Oman society."
	Professional learning communities	Activation of professional learning communities.	Info7: "The professional learning communities should be activated more. I mean, the trainee must transfer training to his colleagues who are not enrolled in the program to enhance the achievement of the goals set in students' learning in mathematics."
Administration	Policies and Procedures	Collaboration between SIPTT and schools.	Info4: "We want more coordination between the SIPTT and the school to balance the burden of teaching lessons assigned to the trainee teacher and the implementation of the training program's tasks." Info4: "We suggest decreasing the number of classes for trainees, at least, school administration should not assign additional school tasks to them to be able to balance between the completion of mathematics curriculum and the implementation of the requirements of the training program on time." Info6: "From my perspective, it is preferable to consider the teachers enrolled in the training programme. The class load should be reduced when joining the programme. It is preferable to set a ceiling as an upper limit of mathematics classes. For example, about 14 classes weekly. That would give the teacher motivation to join the programme, especially those who were hesitant. While some school administrations understand and consider the teacher who enrolled in the programme, most of them do not consider this aspect and say that the teacher is an employee and has the same responsibilities as other colleagues. Some principals do not have a background in the training tasks required. Thus, there may be a gap between the school administration, educational governorates and the SIPTT." Info7: "I have 21 classes per week and one day off because of the training program, meaning an average of 5 out of 8 classes per day. Plus extra tasks at school. It is better if the trainee gets training leave from school for a year and the training program is intense, or the school is strengthened with another teacher in case a trainee joins the Institute. I know many colleagues withdrew from the program due to the increasing workload when they

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Themes	Sub-themes	Code	Data
			entered the program. Although the trainee gets one day off a week to implement training tasks, they were not benefiting from it due to the workload."
			Info8: "I suggest that the trainee teachers be exempted entirely from school duties during the training period so that will help them to focus on the program and make the best use of it."
		Grading	Info4: "Classify the level of trainees' results (excellent - very good - good - acceptable - weak - fail). This point, I want it to be at the top of the recommendations."
		Nomination	Info5: "There must be a clear and agreed mechanism when registering for the training program."
		Timing of Face-to-face training.	Info4: "I suggest changing the timing of face-to-face training to the beginning of the semester or the end of it."
			Info13: "The face-to-face training timing at the Specialised Institute is not appropriate, so it is better to change it to finish the curriculum as planned, especially the scientific subjects such as mathematics, which need a detailed explanation."
			Info14: "The timing of face-to-face training must be reviewed. I suggest at the beginning or the end of the school's semester."
		Certificate value.	Info4: "I also recommend that the SIPTT must consider the matter of the training certificate. It must have value to the trainee, whether at the professional or academic level."
			Info5: "Another recommendation that searching for an academic or professional institution that accredits the training programme."
			Info12: " Among the recommendations that I would like is the training certificates should have an impact in our career."
			Info14: "It will be useful if the training certificate is linked to teachers' career path."
		Educational Forums	Info10: "My recommendation is that the graduated trainees should not be neglected and should be utilised to the maximum extent, such as inviting them in conducting workshops, seminars, or participating in educational forums. That may enhance and strengthen training's reputation."

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Themes	Sub-themes	Code	Data
		Graduates follow up	Info10: "SIPTT must communicate with graduate trainees, refine their skills continuously, and benefit from their experiences in schools and encourage them."
			Info10: "I recommend continuous encouragement for graduates of the training program. That also will help new trainees in the program or other training programs offered by the SIPTT."
			Info14: "Also among the recommendations is the continuation of the follow-up of the trainees. It was suggested that the former trainee should attend the Institute for one day to retrieve what had been trained and consolidate it further."
		Incentives	Info8: "MOE should encourage and motivate trainees after graduation. The Specialised centre graduate status remains the same. MOE may add tangible or intangible incentives, promotions for trainee teachers who undergo long training (two years).
			Info12: "The incentive does not exist. Honestly, if the institute gives some incentives, that will encourage us."
		Field visits	Info5: "Also, I recommend intensifying field visits by the trainers to follow up with trainees. Also, it must be a precise mechanism and procedures for these visits. It is possible for the trainer to ask the school principal or trainee's peers about the trainees' performance to know the extent of the training effect and whether there are precise changes in his performance."
			Info12: "I hope to increase the institutional support for the trainees through the field visit while performing the tasks in the work environment."
		Institutional activities	Info14: "I suggest that SIPTT conduct orientation tours in the governorates by inviting trainees to share their experience in the program and its usefulness to improve the educational process. In this way, it will be - in my opinion - more realistic and convincing for another mathematics teacher to join. Besides, that will increase publicising the Institute's training programs."

Themes	Sub-themes	Code	Data
		Training location	Info7: "Also, I suggest transferring the training program to the training centres in the educational governorates to respond to trainees' social conditions who have difficulties travelling to SIPTT. Besides, this will decrease training costs."
			Info11: "I suggest transferring training to the educational governorates because some trainees complain about joining the program. Because that is difficult for some to move to Muscat."
Input	Training design	Redesign online training	Info4: "The online training should be modified to be more practical and valuable to the trainee."
			Info6: "…focusing on online training content. It should include programs/applications/software that can be used in e-learning in the training material. It will enrich the training program. It will be more beneficial to the trainees. When designing training programs, the Specialised Institute's orientation focuses on improving how to use blended learning programs (traditional and electronic).
			Info11: "We need intensive online training. We did not have enough know-how to communicate with students electronically, and therefore the training program did not meet all the expectations that I set before joining the program."
			Info14: "It is better for online training to be presented in another form (for example, adding other applications and programs that should be used in teaching mathematics)."
	Content	Integration	Info4: "The lesson plans in the training contents are different from lesson plans that the mathematics teacher practices daily. That confuses the trained teacher, and indeed - personally - I did not take advantage of it because it was not related to my daily work. Therefore, it is preferable to integrate and coherence the MOE plans in training mathematics teachers between (previously existing curricula - Specialised institute training - training on mathematics Cambridge curriculum).
		Reducing tasks	Info5: "SIPTT must review training content."
			Info7: "I suggest that tasks focus solely on applied tasks rather than conducting theoretical research and theoretical tasks in online training as it is just an extra burden."

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Themes	Sub-themes	Code	Data
			Info7: "Emphasis on the practical aspects of the training program because of its positive impact on student learning."
			Info9: "Training content should avoid theoretical aspects that do not directly serve the educational process."
			Info11: "…reducing training tasks required passing the training program, especially action research consisting of 5,000 words, and searching for another alternative, due to the specificity of mathematics from the rest of the subjects, may have ample time to implement the curriculum. In contrast, the mathematics subject requires more significant effort and more commitment to explain the curriculum."
			Info14: "Action research assignment has to change because teachers are not encouraged to join the program due to it."
			Info14: "Action research should be simplified. Its concepts and steps should be classified and explained in the training content because the teachers do not know how to conduct action research."
			Info15: "I recommend deleting action research from the training content."
			Info15: "I suggested reducing the written tasks and should be limited to practical tasks that directly related to teaching mathematics. It would be more beneficial."
			Info15: "The trainees do not prefer to do research due to a lack of previous background or unwillingness to do so. It is better for there to be few practical tasks so trainees can apply them continuously, rather than assigning them many tasks that they may do to pass the training program and then stop using them. Therefore, they will not get benefit from their daily professional practices in the long term."
Process	Delivery	Participatory training.	Info13: "I suggest the application of participatory training with more than one trainer in the training group. If there were a movement between trainers for the training group and trained by more than one trainer, we would benefit more from the trainers' experiences, diversify our experiences, and create more significant knowledge outcomes. Even the trainers' movements, for example, differ when performing the training varies from one trainer to

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Themes	Sub-themes	Code	Data
			another. The trainee can imitate and apply in school even the trainer's movement between the training groups. His direct contact with the trainees is one thing that affects the trainee's motivation and learning other than when we have one trainer who is obligated to him throughout the training program. The diversification of trainers for the training groups in the program is a great and helpful thing."
		Solving technical issues	Info4: "We highly recommend solving technical problems related to the educational platform because we faced difficulty downloading/uploading the required tasks."
	Trainer follow up and feedback	Continuous feedback	Info13: "We need continuous support and follow up from the trainers and giving feedback to the trainees' work in order to benefit and feel the value of their submitted work and learn from the feedback provided."