Professional Development of Mathematics Teachers in Najran: Opportunities and Challenges

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Abstract The present study aimed to identify the main opportunities with which professional development programs provide mathematics teachers at the Education Directorate at Najran. It also aimed to determine the most important challenges these teachers usually face at schools. Therefore, a four- aspect questionnaire to investigate the teachers' viewpoint about classroom teaching practices, resources of professional development, obstacles of professional development, in addition to opportunities and challenges of professional development programs was developed. Then it was delivered to (115) participants among which were (42) males and (73) females. They were all teaching mathematics at the three education stages at public schools at Najran in the academic year 2018/ 2019. The descriptive analytical approach was used to interpret collected data. Results indicated that professional development programs were very effective in improving mathematics teacher' classroom teaching practices, making them more aware of their professional development resources and more capable in distinguishing the main obstacles that hinder their profession. Findings also showed that there were significant differences between participants' responses due to gender in favor of females. Moreover, there were significant differences due to the educational stage in favor of the intermediate and secondary stages. There were also significant differences due to the number of programs teachers received in favor of more than five development programs. Nevertheless, there were no differences due to the teaching experience. Results also showed that the big increase in student's numbers inside classrooms, the length of the teaching material, the frequent absence of students, and the difficulty to follow up the latest in his area of specialty were the most important challenges facing mathematics teachers. Opportunities provided by professional development programs were not highly available because most of the required services mainly health ones did not exist.

Keywords: *professional development, mathematics teachers, obstacles of professional development, opportunities of professional development, challenges of professional development, and teaching practices*

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1. Introduction

The need for professional development always exists because it is impossible for the teacher to keep living with a limited set of knowledge and skills acquired at preparation institutions, which, in turn do not empower him to perform his new roles and responsibilities because of scientific and information progress in the present era. Therefore, he has to keep looking for a renewed level of information, skills and modern trends in teaching methodology. Teaching for him should be a continuous process because a good and creative teacher is someone who seeks knowledge in an ever changing and developing society. Thus, it is urgent to provide the teacher with the latest in all scientific and educational fields like educational methods and techniques because of the difficulties facing his preparation to be fit for any time and place in light of ICT revolution. This, in turn, needs

preparing programs for teacher's professional development under the supervision of a group of capable and specialized educators to keep professionally developing this teacher in accordance to modern trends and technologies in teaching [1]. Today's teacher should keep pace with successive changes and developments and comprehend the multiplicity in his roles and responsibilities. He, after being the main source of and a lecturer for information, has to direct his students and motivate them to discover not recite such information. He also has to promote the attitudes and skills students need to face future challenges [2]. Attention to enhancing the teacher's level and developing him professionally positively and directly affects students' achievement level in addition to the positive impact on school curriculum, methodology, fostering teacher's sense of commitment to develop his professional experience that will allow more and more opportunities for students' learning [3].

Teachers of mathematics, as an important element in the educational process, highly need professional

development because of the great importance this subject has and the big difference that distinguishes it from other subjects. Mathematics as a teaching subject represents a harmonized and balanced mixture of content and modern teaching methodology [4]. Mathematics, in addition to the fact that it is one of the main components of all natural sciences and an important tool to solve current live problems, it is an effective element in scientific development and an important indicator on the availability of technological progress rectifiers [5]. Moreover, effective teaching of mathematics requires a teacher who has the mathematical knowledge; experience regarding the curriculum aims, classroom environment, and students' needs; owns planning skills and implantation via providing students with suitable opportunities to achieve effective learning besides the assessment skills to assess what students learn successfully [6]. Therefore, developed countries seriously seek to improve their students' achievement level in most teaching materials to succeed in international exams like for instance, Trends of the International Mathematics and Science studies (TIMSS) and Program for International Student Assessment (PISA). Henceforth, developed countries started orienting their attention towards the teacher and developing his knowledge and skills because they believe that there is a strong relation between teacher's empowerment, the quality of teaching, and the achievement level of pupils [7].

Most countries, among which is Saudi Arabia, have started paying attention to carry out professional development programs for mathematics teachers to help them develop their teaching capabilities in line with current directions of specialized international organization in teacher preparation and training like for example, Interstate New Teacher Assessment and Support Consortium (INTASC), National Board for Professional Teaching Standards (NBPTS) and National Council For Teacher of Mathematics (NCTM) [2]. All these organizations are keen to prepare plans and set standards for mathematics' teachers training through programs of professional development that include specialized, cognitive, cultural and social aspects because previous training programs worked on teachers' rehabilitation to teach old curricula. Furthermore, current curricula have been developed while teachers have not been professionally developed and trained to implement these modern curricula [7]. In brief, developed curricula need the promotion of teacher's communication, mathematical interdependence and higher order thinking skills; ICT activation in teaching; the ability to use dialogue in classroom environment and other skills that cannot be promoted in short training courses which poses a new challenge on mathematics teachers to be enrolled in professional development programs to go along with the comprehensive development in these curricula and to achieve the aims of teaching them [5].

1.1. Statement of the Problem

Teacher preparation and professional development has become one of the most fateful issues imposed by life developments and the era of rapid challenges and changes that have driven countries all over the world to reconsider their educational systems, in general and teacher preparation and development, in particular. They have

introduced programs that aim to provide teachers with needed educational experience and help them acquire essential professional skills, in order to go along with the latest in the field of technological knowledge and information; interact, produce and contribute to pushing the wheel of progress and prosperity.

In Saudi Arabia, as well as other countries, Ministry of Education has started a great project for the development of mathematics curricula through the adoption of teaching McGraw-Hill, which is one of the American teaching series, in all public education stages. This project mainly focuses on developing or re-organizing mathematics curricula in harmony with international standards and stresses the importance of using varied teaching strategies to deliver the teaching content [11] and [8]. Therefore, the main objective of the present study is to identify the reality of mathematics teachers' professional development in light of this great project, i.e. the adoption of McGraw Hill series, in Saudi Arabia in general and more specifically in Najran region. It in particular seeks to identify the opportunities such program provides teachers with and the obstacles it faces in reality by answering these questions:

- 1) How effective are the professional development programs in improving classroom teaching practices of mathematics teachers at Najran?
- 2) Are there any significant differences between participants' responses to the effectiveness of the professional development programs of mathematics teachers due to gender?
- 3) Are there any significant differences between participants' responses to the effectiveness of the professional development programs of mathematics teachers due to the teaching stage?
- 4) Are there any significant differences between participants' responses to the effectiveness of the professional development programs of mathematics teachers due to the teaching experience?
- 5) Are there any significant differences between participants' responses to the effectiveness of the professional development programs of mathematics teachers due to the number of provided professional development programs?
- 6) What are the main opportunities and challenges of the professional development programs of mathematics teachers in Najran?

2. Theoretical Framework and Related Literature

2.1. Professional Development

The present era requires the presence of a teacher who effectively takes part in developing the educational process by his constructive suggestions and remarks. Efficacy of developed curricula, aids teaching tools will not be achieved unless there is a competent teacher who can by using his knowledge and skills, benefit from these tools to promote the educational process. In current literature, the topic of professional development has a vast space because of its core importance in education and

effective role in promoting the teacher's cognition and skills. Professional development has been referred to, in some studies, as in-service training, professional growth and later on, as continuous professional development and teacher training. All these concepts nearly indicate the concept of professional development with some philosophical and professional variation [9]. The main cause of this shift in terminology use might be due to the teacher's role and the change in professional development aims. In the 1970s and 1980s, professional development programs aimed to increase teachers' knowledge through specialists and experts from outside school. In the nineties of the same century, it was expanded to engage the organizations to which they belong. In the new millennium, the trend has been to design programs to help teachers deeply comprehend the processes of teaching and learning via the direct experience that help students to learn using effective methods [10].

Professional development is every new thing the teacher acquires whether academically, culturally, or professionally and contributes to the improvement of his performance and control over his problems related to teaching methods, motivating students or the nature of the teaching material. Therefore, a teacher can professionally grow as soon as he overcomes a problem [11]. It is every activity the person performs, receives, or participates in resulting in acquiring new experience, modifying conduct besides developing and updating his previous experience involving skills and capabilities. Moreover, a process aims to add knowledge and develop both skills and professional values within the teacher to achieve effective education for students and positive learning outcomes [16] and [12]. On the other hand, it is a continuous developmental process of multi dimensions related to teaching inside and outside school based methodological plans and implementation of enrichment programs and projects to help developing the teacher's performance in all aspects [13]. In addition, professional development is a continuous process through which change in teacher's concepts and practices regarding the teaching methods and curricula to find new ways that fulfill the teaching needs [14,15,16,21].

In brief, professional development aims to promote the teacher's professional level through providing a set of continuous and in advance planned programs and activities by specialized institutions. The teacher should be able to deal with varied forms of new technology. He should be able to go along with successive changes so that he can contribute to solving community problems in general and the educational institution, particularly. That is, professional development aims to enhance the teacher's performance in light of changes and requirements in this era by providing him with competences and skills that help him better perform his duties.

2.2. Aims of Professional Development

Apart from the fact that most, if not all, professional development programs aim to promote the teacher's personality scientifically, academically and behaviorally to best do his jobs, they try to implant the sense of desire to improve his capabilities and skills along with current changes. They for instance, aim to achieve quality in

education and form positive attitudes towards this profession. Besides, they aim to enable teachers to face and adapt to educational changes and reforms through making clear educational system problems and make a joint between theoretical and practical skills [14]. Professional development programs also aim to increase teacher's specialized understanding and his knowledge of assessment applications and alternatives; skills of questioning, writing, discussion and dialogue; and apply teaching models and strategies that activate his role [10]. One more aim of these programs is to enable the teacher to keep along with the latest in the field of the educational theories and the content of the curricula to achieve self-confidence, better students' achievement and effectiveness in teaching [2]. Programs of professional development make a connection between theory and practice in teaching. They enhance the creative aspects within teachers and cooperation with colleagues to solve problems they face. In addition, they enable teachers to use information resources, search for the newest in teaching methodology, encourage them to be lifelong learners and apply educational theories inside and outside classrooms [17].

3. Methodology

3.1. Study Approach

The present study adopted the descriptive approach, which is believed to be the most appropriate to answer the questions about the reality of mathematics teachers professional development programs in accordance with the opportunities they provide and the challenges they meet.

3.2. Population

Population of the present study involved all mathematics teachers in the three educational stages, elementary, intermediate, and secondary, in Najran region in the academic year 2018/2019.

3.3. Sample

The sample consisted of (115) teachers who were all teaching mathematics in the elementary, intermediate and secondary stages in the public schools in the Directorate of Education in Najran. Table 1 shows the distribution of study sample.

3.4. Instrument

The study instrument consisted of a four-dimension questionnaire mainly, classroom practices, sources of professional development, obstacles of professional development, opportunities and challenges facing mathematics teachers. Independent variables like gender, educational stage, years of experience and number of professional development programs were accounted for. For the sake of making data analysis easier, a weight was assigned for each response to every question in the questionnaire starting from "5" points for "strongly agree"

"4" points for "agree", "3" points for "neutral", "2" points for "disagree" and "1" point for "strongly agree". Table 2 presents the criterion for eliciting data and explaining mean scores.

3.5. Validity of the Questionnaire

Validity coefficient was calculated in two ways.

1. **Face validity** or what is known as arbitrators' validity where the questionnaire was presented to a set of arbitrators to judge whether the included items can really test what they were developed to.

2. **Construct validity** or what is known as internal consistency.

Correlation coefficients of items in each dimension in the questionnaire are presented in Table 3.

Table 1. Distribution of sample

Variables	Category	Number	Total
Gender	Male	42	115
	Female	73	
Educational stage	Elementary	44	115
	Intermediate	38	
	secondary	33	
Experience	One year to Less than five years	44	115
	Five years to less than ten years	35	
	More than ten years	36	
Professional development programs	None	17	115
	One to five programs	53	
	More than five programs	45	
Total		115	

Table 2. Data eliciting criterion and mean scores explanation

Response Number	Mean score extent	Agreement degree	Availability degree
1	1.00 - 1.80	Strongly disagree	Too low
2	1.81 - 2.60	Disagree	Low
3	2.61 - 3.40	Neutral	Moderate
4	3.41 - 4.20	Agree	High
5	4.20 - 5.00	Strongly agree	Very high

Table 3. Correlation coefficients of items in the questionnaire four dimensions

Ques.	Correlation Coefficient	Question	Correlation Coefficient	Question.	Correlation Coefficient	Question	Correlation Coefficient
The first dimension: Classroom teaching practices of mathematics teachers							
1	0.688**	2	0.624**	3	0.667**	4	0.673**
5	0.517**	6	0.541**	7	0.714**	8	0.597**
9	0.457**	10	0.632**	11	0.717**	12	0.629**
13	0.474**	14	0.607**	15	0.587**		
The second dimension: Resources of mathematics teachers' professional development							
16	0.665**	17	0.747**	18	0.767**	19	0.754**
20	0.786**	21	0.688**	22	0.625**	23	0.657**
24	0.641**	25	0.461**	26	0.698**	27	0.659**
28	0.463**	29	0.696**	30	0.696**		
The third dimension: Obstacles of mathematics teachers' professional development							
31	0.576**	32	0.786**	33	0.453**	34	0.480**
35	0.636**	36	0.724**	37	0.714**	38	0.766**
39	0.609**	40	0.687	41	0.503**	42	0.580**
43	0.554**	44	0.498**	45	0.444**		
The fourth Dimension: Opportunities and challenges of professional development facing mathematics teachers							
46	0.341**	47	0.678**	48	0.402**	49	0.517**
50	0.595**	51	0.583**	52	0.537**	53	0.539**
54	0.523**	55	0.567**	56	0.666**	57	0.530**
58	0.611**	59	0.736**	60	0.544**	61	0.689**
62	0.730**	63	0.718**	64	0.713**		

** : 0.01 significant when $\alpha=0.01$.

Table 4. Correlation coefficient between the score of each dimension and the total questionnaire score

Dimensions of the questionnaire	Correlation Coefficients
Dimension 1: Mathematics teachers' classroom teaching practices	0.546**
Dimension 2: Mathematics teachers' professional development resources	0.525**
Dimension 3: Mathematics teachers' professional development obstacles	0.639**
Dimension 4: Opportunities and challenges of professional development	0.757**

** : 0.01 significant when $\alpha=0.01$.

Correlation coefficient between the score of each dimension and the total questionnaire score are shown in Table 4.

Table 3 & Table 4 reveal that the questionnaire is internally consistent whether at the level of items, dimension or the instrument as a whole. That is, results can be trusted as soon as the questionnaire applied to participants.

3.6. Reliability of the Questionnaire

Cronbach Alpha was utilized to check the questionnaire's reliability coefficients, results are presented in Table 5.

Table 5. Cronbach Alpha coefficients of questionnaire's reliability

Dimension	N. of items	Reliability Coefficient
Dimension 1: Mathematics teachers' classroom teaching practices	15	0.864
Dimension 2: Mathematics teachers' professional development resources	15	0.910
Dimension 3: Mathematics teachers' professional development obstacles	15	0.833
Dimension 4: Opportunities and challenges of professional development facing mathematics teachers	19	0.855
Total Number	64	0.889

Results in Table 5 indicate that Cronbach alpha reliability coefficients for each dimension and for the questionnaire as a whole were ranging between (0.833) and (0.910). Reliability coefficient for the questionnaire as a whole was (0.899). In other words application of the questionnaire can guarantee reliable results once distributed and responded to by study participants.

3.7. Description of the Sample

Table 6, Table 7, Table 8, and Table 9 show the distribution of the study sample

Table 6. Distribution of sample with regard to gender

Number	Gender	Frequency	Proportion
1	Male	42	37%
2	Female	73	63%
Total		115	100%

Table 7. Distribution of sample with regard to the teaching stage

Number	Teaching stage	Frequency	Proportion
1	Elementary	44	38%
2	Intermediate	38	33%
3	Secondary	33	29%
Total		115	100%

Table 8. Distribution of sample with regard to years of teaching experience

Number	Years of teaching experience	Frequency	Proportion
1	One year to Less than five years	44	38%
2	Five years to less than ten years	35	31%
3	More than ten years	36	31%
Total		115	100%

Table 9. Distribution of sample with regard to the number of attended professional development programs

Number	Number of development programs	Frequency	Proportion
1	None	17	15%
2	One program to five programs	53	46%
3	More than five programs	45	19%
Total		115	100%

4. Results and Discussion

4.1. Results Related to the First Question

To answer the first question "*How effective are the professional development programs in improving your classroom teaching practices as a teacher of mathematics?*" Mean scores and standard deviations for participants' responses were extracted as shown in Table 10, Table 11, and Table 12.

Findings in Table 10 indicate that the teaching practices were available to a very high degree ($M=4.29$). Mean scores of participants' responses extended from high ($M=3.87$) and very high ($M=4.74$). One interesting explanation of this high mean score of this dimension may be because of the teachers' competency in preparing students; their focus, while teaching the scientific content, on issues related to students' life; and the use of varied teaching methods. Provision of opportunities by teachers to engage students in gathering, organizing and analyzing data; teachers' utilization of available tools to teach mathematics in addition to their employment of suggested plans and methods included in the teacher's guide to carry out the lesson were also of effective role in this high mean score. Other factors like, for example, encouraging students to think critically and creatively; utilizing active learning strategy, problem solving approach and cooperative learning; and helping students to implement projects and make leaflets were also of great assistance to raise participants' awareness of their teaching practices.

Table 10. Mean scores and standard deviations of participants' responses to classroom teaching practices items

N.	Teaching practices	M.	SD	Rank	Availability degree
1	I prepare students at the beginning of the lesson.	4.74	0.497	1	Very high
2	While teaching the scientific content, I focus on issues from students' life reality.	4.24	0.844	10	Very high
3	I use varied methods to teach the scientific content.	4.48	0.667	4	Very high
4	I engage students in data gathering, organizing and explaining.	4.36	0.691	8	Very high
5	I use the available tools to teach mathematics.	4.41	0.700	6	Very high
6	I use the suggested plans or methods to implement lessons included in teacher's guide.	3.92	0.829	14	High
7	I motivate students to think critically and creatively.	4.39	0.757	7	Very high
8	I apply active learning strategy while teaching the textbook.	4.50	0.730	3	Very high
9	I use problem-solving method in teaching.	4.36	0.740	9	Very high
10	I use cooperative learning as one of the important teaching strategies	4.45	0.910	5	Very high
11	I explain to students how to implement projects in some lessons.	3.95	0.944	12	High
12	I use survey-based teaching.	3.87	0.932	15	High
13	I work on enhancing concepts within students.	4.55	0.716	2	Very high
14	I recommend students to make various leaflets for varied activities.	3.93	1.006	13	High
15	I help my students carry out co-curricular activities.	4.21	0.789	11	Very high
Average mean score		4.29	0.466		Very high

Table 11. Mean scores and standard deviations of participants' responses to items of professional development resources

N.	Professional development resources	M.	SD	Rank	Availability degree
16	I attend orientation meetings of development projects.	4.28	0.854	9	Very high
17	I attend seminars related to learning and teaching mathematics.	4.40	0.711	4	Very high
18	I attend and participate in workshops about mathematics education.	4.37	0.743	7	Very high
19	I attend and participate in workshops related to educational fields.	4.29	0.723	8	Very high
20	I attend and participate in workshops related to technical fields.	4.17	0.830	12	High
21	I attend conferences, seminars or lectures in new technical programs that are useful for teaching and learning mathematics.	4.25	0.724	10	Very high
22	I attend training programs related to certain specialization subject in mathematics.	4.54	0.653	1	Very high
23	I attend training programs related to assessment of student learning.	4.41	0.687	3	Very high
24	I contact professionals to benefit from mathematics professors at universities.	4.03	0.982	14	High
25	I benefit from colleagues in specialty area inside and outside school.	4.48	0.693	2	Very high
26	I continue studying the scientific fields in teaching and learning mathematics.	4.23	0.817	11	Very high
27	I participate in useful electronic forums related to specialization.	4.03	0.873	15	High
28	I benefit from competent supervisors.	4.40	0.723	5	Very high
29	I benefit from a variety of sources like specialized journals, books, and websites.	4.38	0.768	6	Very high
30	I benefit from programs conducted by some specialized companies in education.	4.14	0.804	13	High
Average mean score		4.29	0.516		Very high

Results in Table 11 prove that resources of professional development were available to a very high degree ($M=4.29$). Mean scores in this dimension ranged between high ($M=4.03$) and very high ($M=4.54$). Teachers' provision with opportunities to attend orientation meetings and seminars related to learning and teaching mathematics specific for development projects; participation in teaching mathematics workshops and technological fields; attending conferences, seminars and lectures about new technology in teaching mathematics were the most important factors in this dimension. Attending training specific to mathematics teaching and assessment; contacting mathematics specialists inside and outside universities; taking part in useful electronic forums; and benefitting from programs provided by some specialized companies were also very helpful to raise participants' perceptions about the resources of professional development.

However, existence of professional development obstacles was believed to be of a moderate degree ($M=3.22$). Mean scores of participants' responses to items included in this dimension extended from moderate ($M=2.70$) to high ($M=4.03$) indicating that all these obstacles really hinder their jobs as teachers. Most of

participants believed that their frequent business inside school does not allow me to attend professional development activities ($M=4.03$); the weak financial incentives to participate hinders participation in professional development activities ($M=4.03$); professional development activities conflict with my daily school schedule ($M=3.90$); and the implementation of professional development activities requires time outside formal work ($M=3.80$) were the most serious obstacles. Participants' viewpoint that the routine, unattractive and boring activities, the weak content and the weak level of program presenters besides the choice of programs' content without consulting the teachers views represent another set of obstacles ahead of professional development programs. The lowest and only weak mean score ($M= 2.16$) was to indicate participants' opinion regarding the fact that attending professional development activities is not helpful. These difficulties can be because development programs are not useful for teachers and normally delivered by the central authority and presented by supervisors without teachers' effective participation. Therefore, it can be strongly claimed that these results corroborate the findings of a set of studies like, for instance [18,19,20,21,22].

Table 12. Mean scores and standard deviations of participants' responses to items of professional development obstacles

N.	Professional development obstacles	M.	SD	Rank	Availability degree
31	Professional development activities conflict with my daily school schedule.	3.90	1.116	3	High
32	Implementation of professional development activities requires time outside formal work.	3.80	1.110	4	High
33	My frequent business does not allow me to attend professional development activities.	4.03	1.008	1	High
34	My academic qualification through my previous education is sufficient.	2.72	1.239	13	Moderate
35	Attending professional development activities is not helpful for me.	2.16	1.159	15	weak
36	Professional development activities are routine, boring and unattractive.	2.70	1.311	14	Moderate
37	There is weakness in the scientific content of the professional development activities.	2.92	1.278	11	Moderate
38	Providers of professional development activities are of weak levels.	2.90	1.180	12	Moderate
39	Professional development activities are determined and chosen without the teacher's knowledge or involvement.	3.30	1.242	6	Moderate
40	The high financial costs hinder participation in professional development activities.	2.95	1.276	10	Moderate
41	My frequent connections with colleagues hinder participation in professional development activities.	3.09	1.081	8	Moderate
42	My frequent family links hinders participation in professional development activities.	3.54	1.237	5	High
43	The weak financial incentives to participate hinder participation in professional development activities.	4.03	1.100	2	Moderate
44	School leaders do not encourage me to attend and participate in professional development activities.	3.01	1.436	9	Moderate
45	Places for implementing professional development activities are inappropriate.	3.28	1.218	7	Moderate
Average mean score		3.22	0.659		Moderate

Table 13. Results of T. test of participants' responses in accordance with gender

Dimension	Gender	N.	M.	SD	T value	P value	Significance Yes/ No
Teaching practices	Male	42	4.16	0.516	2.402	0.018	Yes
	Female	73	4.37	0.420			
Recourses of professional development	Male	42	4.17	0.501	1.944	0.045	Yes
	Female	73	4.36	0.515			
Obstacles of professional development	Male	42	3.07	0.648	1.921	0.037	Yes
	Female	73	3.31	0.653			
Opportunities and challenges of professional development	Male	42	3.17	0.596	1.851	0.067	No
	Female	73	3.41	0.712			
The whole questionnaire	Male	42	3.64	0.399	3.269	0.001	Yes
	Female	73	3.86	0.357			

4.2. Results Related to the Second Question

To answer the second question, "Are there any significant differences between participants' responses to the effectiveness of the professional development programs of mathematics teachers due to gender?" T. test was used. Results are presented in Table 13.

Results in Table 13 reveal significant differences in participants' responses in the first dimension in favor of female teachers. A possible explanation for this result is the numerous loads teachers have. The competition between female teachers to attend professional development workshops is normally higher than the competition between male teachers and so they gain better professional development through discussion, observation, experimentation and training and consequently they acquire new skills and attitudes better than male teachers. Another interpretation lies in the fact that professional development for female teachers means a group of correlated aspects like self- cognitive development, professional development inside classrooms' environments besides the interactive, cooperative and social work with others. That is, working with learning groups whether inside or outside school allows the transfer of knowledge and successful experience between female peers better than between male

ones. Moreover, female teachers' ability to plan well for students' learning outcomes and for bigger aims not for in-detail information; design suitable teaching activities; utilize strategies responsive to students' needs and facilitate effective learning for students and engage them in problem solving seems better than the ability of their male colleagues. In addition, female teachers are more successful than males in promoting students critical and creative thinking, utilizing varies methods for motivating students, managing effectively classroom time and learning material, being capable of self-assessment, students' assessment and feedback provision [24,25,26,32].

4.3. Results Related to the Third Question

To answer the third question, "Are there any significant differences between participants' responses to the effectiveness of the professional development programs of mathematics teachers due to the teaching stage?" ANOVA for participants' responses was used. Results are shown in Table 14.

Results in Table 14 indicate apparent differences between participants' responses. To understand the significance of these differences, Scheffe test was used. Results are presented in Table 15.

Table 14. ANOVA for participants' responses programs regarding the teaching stage

Dimension	Source of variance	Sum of squares	DF	Mean of Squares	F value	P value	Significance Yes/No
Teaching practices	Between groups	0.091	2	0.046	0.207	0.014	Yes
	Within groups	24.693	112	0.220			
	Total	24.784	114				
Resources of professional development	Between groups	0.684	2	0.342	1.290	0.279	No
	Within groups	29.705	112	0.265			
	Total	30.389	114				
Obstacles of professional development	Between groups	2.785	2	1.392	3.339	0.039	Yes
	Within groups	46.706	112	0.417			
	Total	49.491	114				
Opportunities and chances	Between groups	0.314	2	0.157	0.336	0.715	No
	Within groups	52.240	112	0.446			
	Total	52.554	114				
The whole questionnaire	Between groups	0.694	2	0.347	2.678	0.037	Yes
	Within groups	14.506	112	0.130			
	Total	15.199	114				

Table 15. Scheffe test for the significance of differences regarding the teaching stage

Dimension	Teaching stage	Mean score	Elementary	Intermediate	Secondary
			4.42	3.10	3.098
Obstacles of professional development	Elementary	3.42	-	*	*
	Intermediate	3.10	-	-	*
	Secondary	3.098	-	-	-

Statistics in Table 15 reveal that there are significant differences between the responses of participants due to the teaching stage in favor of teachers in intermediate and secondary stages. Shortage of experience among mathematics teachers in the elementary stage in comparison with the experience of peers in the intermediate and secondary stages might be the main source of this variation. Therefore, teachers of elementary stage should be enrolled in programs supervised by specialist educators who can develop them professionally in accordance with new technological trends in teaching. They also have to understand multiplicity in their roles and responsibilities because an elementary mathematics teacher should have mathematical ability, experience in the curriculum outcomes, classroom environment and

students' needs. They, moreover, should be capable of planning and implementing skills via the available appropriate opportunities for his students' effective learning and assessment skills to assess their learners successfully. All of these results corroborate the findings of [16,27,28,29,30].

4.4. Results Related to the Fourth Question

To answer the fourth question, "Are there any significant differences between participants' responses to the effectiveness of the professional development programs of mathematics teachers due to the teaching experience?" ANOVA was used to identify the differences between participants' responses. Results are presented in Table 16.

Table 16. ANOVA for participants' responses regarding the teaching experience

Dimension	Source of variance	Sum of squares	DF	Mean of Squares	F value	P value	Significance Yes/No
Teaching practices	Between groups	0.426	2	0.213	0.979	0.039	Yes
	Within groups	24.358	112	0.217			
	Total	24.784	114				
Recourses of professional development	Between groups	1.398	2	0.699	2.701	0.027	Yes
	Within groups	28.991	112	0.259			
	Total	30.389	114				
Obstacles of professional development	Between groups	1.430	2	0.715	1.666	0.194	No
	Within groups	48.061	112	0.429			
	Total	49.491	114				
Opportunities and challenges of professional development	Between groups	0.428	2	0.465	0.460	0.633	No
	Within groups	52.126	112	0.214			
	Total	52.554	114				
The whole questionnaire	Between groups	0.647	2	0.323	2.489	0.048	Yes
	Within groups	14.553	112	0.130			
	Total	15.199	114				

Findings, in Table 16, reveal significant differences between participants' responses to items in the first dimension (teaching practices) and second one (resources of professional development). But, there were no significant differences in their responses to the third dimension (obstacles of professional development) and the fourth one (opportunities and challenges of professional development of professional development). These results can be due to the development of the teacher's sense of direct responsibility to develop himself professionally, define an overall vision to interact with activities of professional development, and allow full-time spaces to practice activities that develop his/her professional and educational skills. Teachers can develop their professional skills through training programs, visits exchange, technical guidance, mentoring, qualification, and providing educational counseling to solve problems. Promoting the teacher's professional level can be through relevant training centers, which are based on disseminating successful experiences of teachers, solving problems facing them, and enrolling them in pre-service training courses. The existence of significant differences in participants' responses to the third and fourth dimensions may be referred to the lack of sufficient tools to evaluate professional development programs, and the weak relationship between professional development programs on, one hand and classroom practices and student achievement on the other hand. Therefore, teachers who teach the same level should be trained together and separated from teachers of intermediate and secondary stages. There should also be annual follow-up programs that are financially rewarded as incentives. All these results are in congruence with the findings of [19,20,21,22,31,34,35].

4.5. Results Related to the Fifth Question

To answer the fifth question "Are there any significant differences between participants' responses to the effectiveness of the professional development programs of mathematics teachers due to the number of professional development programs?" ANOVA was used to identify the differences between participants' responses. Results are presented in Table 17.

Table 17 indicates significant differences between participants' responses to the first and fourth dimensions.

Nevertheless, there were no significant differences between their responses to the second and third dimensions. To understand in favor of which dimension these differences were, Scheffe test was carried out. Results are in Table 18.

Results in Table 18 show that there are significant differences in favor of more than five development programs whether at the level of Opportunities and challenges of professional development, or at the level of the questionnaire as a whole. This can be due to the fact that professional development programs locally and nationally affect policies and practices that have impact on their work through clear measurable standards at the individual and institutional level, on one hand and cooperation between specialties based on the interdisciplinary partnership philosophy to meet at a common point that is beneficial in the development of the educational system outcomes in schools, the teachers, and other stakeholders involved in the educational process, diversity and fairness in practices. Professional development programs should provide equitable opportunities for learning and evaluation of educational policies and practices to support learning outcomes, diversity of participants, and use of necessary authorities and resources to clarify the mission of these programs. They should also establish organizational structures that support the development of different learning stages of education, teachers and other stakeholders. Programs and activities of professional development should be prepared according to teachers' needs, and in light of his professional experience level and personality characteristics to support his pre-service preparation. That is, professional development has to be a critical factor in all educational reform and improvement programs. Therefore, professional development programs should be an integral part of this improvement plan, consistency of objectives and content with the academic learning basic requirements and grade level. The existence of clear and aimful philosophy and objectives upon which these programs are built, in accordance with teachers' training needs to ensure their effective participation and nominal attendance elimination without any benefit from these programs. In short, these results can be considered in agreement with the findings of a set of studies in this area like for example, [22,28,29,35].

Table 17. ANOVA for participants' responses regarding the number of professional programs they received

Dimension	Source of variance	Sum of squares	DF	Mean of squares	F value	P value	Significance Yes/ No
Teaching practices	Between groups	0.376	2	0.188	0.863	0.025	Yes
	Within groups	24.408	112	0.218			
	Total	24.784	114				
Resources of professional development	Between groups	0.142	2	0.071	0.262	0.770	No
	Within groups	30.248	112	0.270			
	Total	30.389	114				
Obstacles of professional development	Between groups	1.330	2	0.665	1.547	0.017	No
	Within groups	48.161	112	0.430			
	Total	49.491	114				
Opportunities and challenges of professional development	Between groups	3.027	2	1.514	3.423	0.036	Yes
	Within groups	49.526	112	0.442			
	Total	52.554	114				
The whole questionnaire	Between groups	0.828	2	0.414	3.228	0.043	Yes
	Within groups	14.371	112	0.128			
	Total	15.199	114				

Table 18. Scheffe test for the significance of differences regarding the number of development programs they received

Dimension	Number of development programs	M	None	1-5	More than 5
			3.12	3.42	3.53
Opportunities and challenges of professional development	None	3.12	-	-	-
	1-5	3.42	*	-	-
	More than 5	3.52	*	*	-
			3.68	3.84	3.85
The whole questionnaire	None	3.68			
	1-5	3.84			
	More than 5	3.85			

Table 19. Means and standard deviations for participants' responses regarding Opportunities and challenges of professional development

N	Obstacles	M	SD	Rank	Degree of availability
46	Mathematics teacher has no time to carry out extra activities.	4.15	1.118	4	High
47	Mathematics teacher has difficulty in following the latest related to his specialty.	3.60	1.107	5	High
48	Mathematics teacher cannot carry out treatment plans to help low achievement students.	3.10	1.318	11	Moderate
49	Mathematics teacher is unable to implement enrichment plans for high achievement students.	3.08	1.285	12	Moderate
50	Mathematics teacher has a challenge in discovering the talented inside the classroom.	3.54	1.293	7	High
51	The large number of students in classroom is a serious problem for the teacher.	4.44	0.929	1	Very high
52	Course length is one of the biggest challenges for mathematics teacher.	4.22	0.989	2	Very high
53	The frequent absence of students hinders implementation of the teachers' teaching plans.	4.22	1.007	3	Very high
54	Changeable weather conditions hinder implementation of the teacher's on time plans.	3.55	1.118	6	High
55	The technical tools that are easy for students to use make them not interested in the lesson.	3.51	1.293	8	High
56	Mathematics teacher has great opportunities to attend various professional development programs.	3.05	1.248	13	Moderate
57	Mathematics teacher has opportunities to easily study in his / her field of specialization.	3.04	1.273	14	Moderate
58	Mathematics teacher can obtain a higher degree when he likes.	3.20	1.306	10	Moderate
59	Mathematics teacher is provided with special services and facilities while traveling.	2.78	1.626	15	Moderate
60	Mathematics teacher feels valued and respected by the community.	3.37	1.239	9	Moderate
61	Mathematics teacher gets valuable prizes for his efforts.	2.59	1.432	16	Weak
62	Mathematics teacher enjoys all various services in health clubs.	2.55	1.488	18	Weak
63	Mathematics teacher has the priority when going to any institution in recognition of his efforts.	2.54	1.546	19	Weak
64	Mathematics teacher is granted financial rewards for his outstanding efforts.	2.57	1.623	17	Weak
Average mean score		3.32	0.679		Moderate

4.6. Results Related to the Sixth Question

To answer the sixth question, "*What are the main opportunities and challenges of professional development programs of mathematics teachers in Najran?*" Mean scores and standard deviations of participants' responses were extracted. Results are shown in Table 19.

Results in Table 19 indicate that there are some opportunities and challenges facing mathematics teachers' professional development programs ranging from very high (M=4.44) and moderate (M=2.54). However, items number 61, 62, 63, and 64 whose mean scores were (2.59, 2.55, 2.54, and 2.57) respectively were believed to be weak opportunities and challenges. This result can be due to rapid developments in scientific and media aspects accompanied by rapid change in social and educational aspects. A teacher is, therefore, has to interact with these developments in a way that serves his role in light of new educational theories. He has to achieve a qualitative change in teaching and learning that looks at the learner as the center of the educational process. Therefore, he has to move from lecturing into a facilitator who helps students to discover new knowledge using various current teaching methods. He has to distinguish and identify the educational problems in the field while implementing new curricula. He also has to deepen communication with colleagues and play a significant role in developing the

educational process. In addition, mathematics teacher in Saudi Arabia has to keep up with the latest in education and apply it in accordance with the international standards, particularly after the adoption of using McGraw hill series to develop mathematics and science curricula. Thus, it is very important to reconsider developing professionally mathematics teachers through programs that fulfill these new needs in light of such developed curriculum. Therefore, these results can be seen in agreement with the results of [8,18,22,31,32,33,34].

5. Recommendations

5.1. Recommendations for Educational Stakeholders

Stakeholders of developing mathematics teachers professionally are recommended to:

1. Pay attention to mathematics teachers' professional development programs in Saudi Arabia that fulfill their needs in light of the professional acceleration of teachers of mathematics at a global level.
2. Develop the professional skills of mathematics teachers through training programs, visit exchange and educational supervision.

3. Develop programs of college of education programs that can contribute to organizing training programs, supervision, qualification and providing educational consultations to solve problems.
4. Be concerned to achieve quality in education, form positive trends towards this profession, enable teachers to face varied educational changes and reforms, through showing them the problems of the educational system, and educating them about their role in solving them on one hand, and improve the learning process by improving their theoretical and practical skills.
5. Enable mathematics teachers to walk along with and apply developments in the field of teaching and learning theories that achieve efficacy in teaching.
6. Enable mathematics teachers to walk along with the latest in the curricula content.
7. Enable mathematics teachers to acquire the skills of educational technology utilization in teaching mathematics.
8. Develop the creative aspects of teachers, encourage them to be innovative at work, and cooperate with colleagues.
9. Adopt programs that are based on the activation of the learners' role.
10. Consider the professional development of mathematics teachers as a critical factor in all educational reforms and improvement programs.

5.2. Recommendations for Further Research

Researchers are recommended to conduct studies that aim to

1. Survey the viewpoints of educational supervisors to identify the training needs of mathematics teachers in the intermediate stage in light of the requirements of contemporary professional standards achievement.
2. Evaluate professional development programs for mathematics teachers at different levels.

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