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Evaluation of English Language Teacher Professional Development Programs in an EFL Context: A Mixed Method Study

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Abstract

This study intended to assess how ELT teachers evaluate the quality of Pre and In-service TPD Programs in an EFL context. Data for this study came from a survey and follow-up interviews with 300 high school EFL teachers. The findings suggest that the ELT teachers recommend professional development programs that prioritize continuous learning, knowledge and skills updates, subject matter expertise, and technology integration in teaching practices. The study reveals challenges faced by the ELT teachers in participating in TPD programs, such as the need for innovative and updated programs, practical application focus, budget constraints, and high-quality facilitation. The characteristics of a good TPD program from the perspective of ELT teachers were also discussed, emphasizing the importance of addressing immediate needs, incorporating the latest trends and innovations, aligning with international standards, and providing support systems and collaboration opportunities. In addition, the study highlighted the motivation of the ELT teachers for professional development and the need for targeted programs to support their specific needs. Finally, suggestions were made and implications were discussed.

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Introduction

Teacher Professional Development (TPD) encompasses various educational programs in English Language Teaching (ELT), ranging from workshops to critical reflection on teaching practices. Different terms have been used refer to TPD, such as 'academic development', 'educational development', 'faculty development', and 'instructional development'. The quality of teachers and their motivation to participate in training and implement innovations are believed to have an impact on school reform initiatives. PD for ELT teachers is seen as crucial for educational improvement and reform in schools, as it can update instructional techniques and enhance student learning.

Improving ELT teachers' knowledge and practice can lead to changes in teacher growth, variations in instructional techniques and strategies, and improvements in student learning. TPD is considered an important process and outcome for teachers in general, and specifically for language teachers. While a large array of research studies has investigated the issue of TPD (e.g., Boud & Brew, 2013; Cilliers & Herman, 2010; Opfer & Pedder, 2011; Atkins & Vasu, 2000; Li et al,2022; Nguyen et al, 2022; Popova et al., 2022), there is a lack of research conducted in the Iraqi ELT context. Therefore, this study aims to address this gap by investigating and evaluating the quality of TPD programs among ELT teachers in Iraq.

Literature Review

Desimone (2009) underscores five key components of TPD as (1) the need for emphasis on content materials; (2) the opportunities mentioned for active learning; (3) coherence of the PD program; (4) duration of the program; and (5) opportunities for collective participation. Improvement in ELT teachers' knowledge and practice are likely to foster changes in teacher growth, variations in teachers' instructional techniques and strategies as well as enhancement in student learning. Whatever the terms definitions and frameworks, TPD is perceived to be an important process both and product for teachers in general and language teachers in particular. In the following sections besides giving a brief sketch of the background of the study, the statement of the problems, research questions and objectives of the study are elaborated on at length.

The literature abounds with research on Teacher Professional Development (TPD) on a wide range of issues (e.g. Ackland, 2000; Atkins & Vasu, 2000; Boud & Brew, 2013; Corcoran, 1995; Cilliers & Herman, 2010; Fullan, 2002; Guskey, 2002; Opfer & Pedder, 2011; Sancar et al., 2021).

These studies and many more have tapped the issue from a wide variety of perspectives from TPD definitions and scope determination as in Stes, Min-Leliveld, Gijbels, & Van Petegem (2010); Wei, Darling-Hammond, Andree, Richardson, & Orphanos, (2009); Wenglinsky, (1997); Lawless and Pellegrino (2007) to TPD aspects and components (Khany and Amoli ,2016); to TPD analytical frameworks as in Ermeling, (2010); Frey & Fisher, (2009); Guay, Valois, Falardeau & Lessard, (2016); Levine & Marcus, (2010); Morais, Neves, & Alfonso, (2005); Seymour & Osana, (2003); to TPD content knowledge as in Hill et al.

(2009) to TPD evaluation as in Topkaya and Küçük (2010), Uysal (2012); and Yoon, and Kim, M. (2022).

Having reviewed the literature on ELT TPD programs in general and in the context of Iraq in particular, it was revealed that not many studies have addressed the given issue in Iraqi ELT context. For instance, in a study by (Al-Ustath., 2016), having considered the trainees' perspectives, he evaluated the quality of Iraqi EFL teachers' in-service teacher training course. His findings indicated that the trainees' attitudes towards the courses were positive in general; however, they expected more improvements in terms of the basic English knowledge as the most fundamental aspect for teaching English curriculum. In addition, he pointed to some shortcomings that still exist in their planning, assessment phases, and its influence on teachers' activities. In a recent study by (Aliakbari, M., & Hasoon, 2022), they examined the relationship between Iraqi EFL teachers' professional development (PD) and their classroom management techniques. Their findings uncovered that there is a statistically positive relationship between professional development programs and teachers' classroom managements. As they have analyzed the results of the interview questions, they highlighted the need for more PD programs. Since the more the levels of teachers' professional development activities, the higher scientific levels of students.

In an overview by Altae (2020), the key five stages of the development of the Iraqi English language curriculum was reviewed across a span of one hundred years in detail. On their study, they have reviewed the curriculum change during the above-mentioned period and investigated if the right procedures were followed. Their review finally unfolded the educational dilemma of the Iraqi system.

With all these however, it seems that more systemic studies are needed to classify the studies on TPD especially in the Iraqi ELT context. Indeed, to see how vivid and content specific such studies are, we need more concept mappings and meta-analyses to carry out.

This study

This study intends to fill the gap in the Iraqi context through investigating and evaluating the quality TPD programs among ELT teachers in Iraq. To this end the following research questions were posed:

How do the Iraqi ELT teachers evaluate the quality TPD Programs in Iraq?

What kinds of Programs do ELT teachers propose for TPDs in Iraq?

Methodology

Research design

This study employed a mixed-methods approach to evaluate the TPD Programs in the Iraqi ELT context. Data was gathered through a survey and subsequent interviews involving 300 high school EFL teachers in Iraq. In the initial phase of the current study, as the quantitative part, the TPD questionnaire (Khany & Azimi Amoli, 2016) was distributed among the participants, followed by a semi-structured interview as the qualitative phase pf the study. Having studied different types of mixed method research design, the sequential explanatory

design was employed. This type of design, as elaborated on by Creswell and Clark (2011), starts with a quantitative phase in which the researchers, firstly, collect and analyzes the collected data. Then, the collected data of this phase will be used to carry out the qualitative part of the study for data collection and analysis. The two phases are of paramount significance, and none of the them prioritize the other one when addressing the study's research questions. More specifically, as pointed out by Ivankova et al. (2006), this phase facilitates the explanation of the results of the quantitative phase by probing the perspectives of the participants in more details.

Figure 1. Mixed-method design and procedures of the study

Participants

In this study, 300 Iraqi English teachers at Secondary and University level were randomly selected to take part in the current study. They were all native speakers of Arabic teaching English as foreign language in Iraq. 164 out of 300 were male and 136 were female with the age range of 25 to 45. They were M.A., B.A. and Ph.D. holders of Teaching English as a Foreign Language (TEFL) teaching experiences ranged from one to over 20 years. Table 1 and 2 presents the distribution of the participants based on gender and years of experience.

Table 1. *Distribution of ELT Teachers based on Gender*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	156	51.8	51.8	51.8
	Male	145	48.2	48.2	100.0
	Total	301	100.0	100.0	

Table 2. *Distribution of ELT Teachers based on Years of Experience*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-5 Year	150	49.8	49.8	49.8
	6-10 Year	46	15.3	15.3	65.1
	11-15 Year	60	19.9	19.9	85.0
	16-20 Year	45	15.0	15.0	100.0
	Total	301	100.0	100.0	

Instruments

The modified version of the Khany and Amoli (2016) Teacher Professional Development Inventory was administered to the participants through both electronic and in-person methods. This questionnaire assessed the concept of TPD based on four key components: Knowledge (items 1 to 31), Skills (items 32 to 93), Programs (items 94 to 102), and Culture-specific items (items 103 to 120). Additionally, six open-ended questions were included in the questionnaire to gather the perspectives of pre-service and in-service English language teachers regarding TPD programs in Iraq.

To ensure the content validity of the open-ended questions, an inclusive review of relevant literature on TPD was conducted. An interview protocol consisting of essential indices of TPD programs, as proposed by scholars and researchers in the field, was developed. The initial pool of open-ended questions was piloted through a focus group interview, with one participant from each group contributing to the generation of questions for the written interview scale. Their responses were qualitatively and quantitatively analyzed, resulting in the selection of seven major questions for the actual interviews. The questionnaire's validity was ensured through consultation with a panel of experts, and its reliability was calculated and reported to be 0.91 (Cronbach's $\alpha = 0.91$).

Procedures of Data Collection

When the questionnaire was finalized, they were distributed electronically and in-person among the secondary and university EFL teachers in Iraq. A detailed explanation of how to complete the questionnaire was provided at the beginning of the questionnaire. The scoring procedures follow on a five Likert scale ranging from 1= none at all to 5= very much. Of three hundred and fifty distributed questionnaires, 300 were returned.

In addition, follow-up interviews were conducted with a subset of respondents to gain deeper insights. In the interview, teacher participants were asked to elaborate on the questions that they had answered in the survey. Each interview took about 30 minutes. The semi-structured interviews were carried out in a systematic way for giving us enough freedom to examine beyond the instant responses to the questions posed.

Ethical considerations were paramount, ensuring participant confidentiality and obtaining ethical approval. The collected data was compiled into a comprehensive report, emphasizing the perspectives, recommendations, and implications for improving TPD programs for Iraqi ELT teachers. MAXQDA version 2020 and the Statistical Package for Social Science (SPSS) were utilized for data management and analysis.

Data Analysis

This study consisted of two data analysis processes. First, the findings of the questionnaire distributed were quantitatively analyzed for the frequency and distribution of participants answers. Bearing in mind the nature of the current research which demands interview and researching participants' perspective, this phase was, then, followed by a thematic analysis of the participants' responses to the open-ended questions to extract the main themes, tenets, features, strategies, and programs suggested by ELT teachers in Iraq for the practice and quality of TPD programs in Iraq. After transcribing the audio tape of the interviews which were conducted in English, we identified recurrent themes by thematic analysis**.** After reading the surveys and the transcribed interviews, the responses were coded to identify particular themes in the data. To this end, as mentioned earlier, SPSS version 29 and MAXQDA Version 20 was run.

Results

Descriptive analysis

The initial section of the questionnaires examined the knowledge of Iraqi ELT teachers in seven different areas: Content Knowledge, Pedagogical Knowledge, Technology Knowledge, Pedagogical Content Knowledge, Technological Content Knowledge, Technological Pedagogical Knowledge, and Technological Pedagogical and Content Knowledge. Table 3 shows that the highest mean value is associated with teachers' content knowledge (m=13.18, Std.=2.08), followed by pedagogical knowledge (m=12.43, Std.=2.33) and pedagogical content knowledge (m=10.45, Std.=2.16). On the other hand, the lowest mean and Std. values are related to Technological, Pedagogical, Content Knowledge (m=7.62, Std.=1.97) and Technological Pedagogical Knowledge (m=9.27, Std.=2.13), respectively. These findings suggest that pre-service Iraqi ELT teachers need to update their knowledge in technology-related areas.

The second section of the questionnaire assessed the skills of Iraqi ELT teachers, which were divided into eight categories: Planning and Preparation, Lesson Presentation, Lesson Management, Classroom Climate Control, Assessing Students' Progress, Reflection and Self-Evaluation, Critical Thinking Skills, and Supportive Emotional Skills. The table indicates that the highest mean and Std. values for pre-service Iraqi ELT teachers' skills are related to their presentation skills (m=22.99, Std.=3.70), followed by classroom climate control skills (m=18.52, Std.=2.67), and assessing students' progress skills (m=17.08, Std.=2.71). Conversely, pre-service teachers rated their planning and preparation skills (m=10.44, Std.=2.19), critical thinking skills (m=12.86, Std.=3.50), and reflection and self-evaluation skills (m=17.08, Std.=2.71) with the lowest mean and Std. values, respectively.

The final section of the questionnaire evaluated pre-service Iraqi ELT teachers' perceptions of TPD programs in terms of three aspects: the concept of TPD program, pedagogies of TPD program, and the institutional forms of delivery in TPD program. The table indicates that the highest mean and Std. values are for pedagogies of TPD program (m=28.31, Std.=4.49), followed by the institutional forms of delivery in TPD program (m=20.82, Std.=3.80), and the concept of TPD program (m=20.01, Std.=3.65), respectively.

Table 3. *Descriptive Statistics of the Teachers*

	N	Min	Max	Mean	Std.
A: Knowledge					
Content Knowledge	150	9.00	20.00	13.1867	2.80073
Pedagogical Knowledge	150	6.00	18.00	12.4333	2.33277
Technology Knowledge	150	7.00	16.00	11.0067	2.16902
Pedagogical Content Knowledge	150	6.00	15.00	10.4533	2.16620
Technological Content Knowledge	150	6.00	16.00	10.4400	2.22095
Technological Pedagogical Knowledge	150	6.00	16.00	9.2733	2.13927
Technological Pedagogical and Content Knowledge	150	3.00	12.00	7.6200	1.97185
B: Skills					
Planning And Preparation skills	150	5.00	15.00	10.4400	2.19358
Lesson Presentation skills	150	13.00	32.00	22.9933	3.70289
Lesson Management skills	150	7.00	23.00	15.0533	3.74665
Classroom Climate Control skills	150	12.00	24.00	18.5200	2.67406
Assessing Students Progress skills	150	12.00	24.00	17.0867	2.71693
Reflection And Self-Evaluation skills	150	8.00	20.00	14.0067	2.75753
Critical Thinking Skills	150	6.00	20.00	12.8667	3.50965
Supportive Emotional Skills	150	10.00	23.00	16.8333	2.90895
C: TPD Programs					
The Concept of TPD Program	150	10.00	27.00	20.0133	3.65085
Pedagogies of TPD Program	150	19.00	40.00	28.3133	4.49927
The Institutional Forms of Delivery in TPD Program	150	14.00	30.00	20.8200	3.80404
Valid N (listwise)	150				

The frequency and percentage of TPD components for pre-service teachers is shown in Table 4. As indicated in the Table, that pre-service teachers rated The Pedagogies of TPD Program as the highest component with 10.1 percentage of the whole, followed by The Institutional Forms of Delivery in TPD Program (8.2%), and Lesson Presentation skill (8.1), respectively. The lowest frequency and percentage are related to the Technology Knowledge (2.7%).

Table 4. *Teachers' Scores of TPD Components*

		F	P	Valid Percent	Cumulative Percent
Valid	Content Knowledge	1691	4.0	4.0	4.0
	Pedagogical Knowledge	1928	4.6	4.6	8.7
	Technology Knowledge	1134	2.7	2.7	11.4
	Pedagogical Content Knowledge	1482	3.5	3.5	14.9
	Technological Content Knowledge	1461	3.5	3.5	18.4
	Technological Pedagogical Knowledge	1479	3.5	3.5	22.0
	Technological Pedagogical and Content Knowledge	1950	4.6	4.7	26.6
	Planning and Preparation	1640	3.9	3.9	30.6
	Lesson Presentation	3370	8.0	8.1	67.7
	Lesson Management	2357	5.6	5.6	41.3
	Classroom Climate Control	2794	6.6	6.7	47.9
	Assessing Students' Progress	2734	6.5	6.5	54.5
	Reflection and Self-Evaluation	2162	5.1	5.2	59.7
	Critical Thinking Skills	317	5.10	5.10	35.6
	Supportive Emotional Skills	2702	6.4	6.5	74.2
	The Concept of TPD Program	3100	7.4	7.4	81.6
	Pedagogies of TPD Program	4239	10.1	10.1	91.8
	The Institutional Forms of Delivery in TPD Program	3440	8.2	8.2	100.0
	Total	41780	99.1	100.0	
Missing	System	396	.9		
Total		42176	100.0		

Types of professional development programs

A total number of ten programs were proposed by Iraqi ELT teachers. As illustrated, almost all of the teachers suggested to hold periodic and continuous innovative conferences, seminars, workshops, and short courses to renew their knowledge and skills (93.33%)(Table 5). In addition, nearly three-fourth of the teachers proposed to have up-to-date programs and courses in accordance with the needs of both teachers and students in the 21st century (90%) followed by recommendation to have programs to promote teachers' subject matter knowledge (86.66%), to have short and periodic courses to develop teachers' technical and practical knowledge and skills (83.33%) and to develop teachers' teaching practices, teaching methodologies, and teaching styles (83.33%). Besides, holding short and periodic courses to renew their language skills and subskills (80%) and holding training workshops to make teachers familiar with different educational and ICT technologies (73.33%) and how to integrate them into language classrooms were also proposed by more than three-fourth of the interviewed teachers (73.33%). Among the recommended programs, holding periodic instructional courses based on teachers' need analysis (60%) and periodic courses in which good classroom practices of other teachers are shared (50%) were the least frequently suggested programs, respectively.

Table 5. *Different Kinds of Professional Development Programs proposed by ELT Iraqi Teachers*

Proposed TPD Programs	F	P
1. Hold periodic and continuous innovative conferences, seminars, workshops, and short courses to renew their knowledge and skills	28	93.33%
2. Have up-to-date programs and courses in accordance with the needs of both teachers and students in the 21st century	27	90%
3. Have programs to promote teachers' subject matter knowledge	26	86.66%
4. Have short and periodic courses to develop teachers' technical and practical knowledge and skills	25	83.33%
5. Have short and periodic courses to develop teachers' teaching practices, teaching methodologies, and teaching styles	25	83.33%
6. Have short and periodic courses to renew their language skills and subskills	24	80%
7. Hold a training workshop to make teachers familiar with different educational and ICT technologies	22	73.33%
8. Hold a training workshop on how to integrate and use different educational and ICT technologies into language classrooms	22	73.33%
9. Hold periodic instructional courses based on teachers' need analysis	18	60%
10. Hold periodic courses in which good classroom practices of other teachers are shared	15	50%

Challenges of ELT teacher professional development programs in Iraq

Eleven main challenges and problems were extracted and indicated in Table 6. Nearly all teachers have mentioned that the main problem regarding these programs is that they are not as much innovative, updated and creative as possible and do not meet the needs of the current century (90%). 83.33% of teachers pointed to the fact that these programs are more theory-based than practice-based and we cannot practically employ them in our classrooms. In addition, cost-effectiveness (80%) and the existence of budget constraints or lack of school and university budgets to support teachers (80%) were mentioned as the third and fourth problems, respectively. Nearly three-fourth of the participants (73.33%) mentioned that these programs are not of high quality and are not hold by experts and experienced teachers. Also, more than half of the students (53.33%) stated that these programs are not as up-to-date as possible and do not involve trainings about different educational and ICT technologies and their application. They, also, mentioned that these programs do not encourage collaboration among teachers, schools, universities, and higher order organizations (53.33%). Moreover, about half of the participants asserted that these programs do not include support system for the teachers (50%). About two-third of the participants (46.66%) reported that teachers' participation in TPD programs is no obligatory and their participation is not valued upon. As the last problem, less than half of the participants (40%) expressed that these programs are not held periodically and in a sustainable way.

Table 6. *The challenges faced by Iraqi ELT teachers in participating in TPD programs in Iraq*

List of challenges in participating in TPD programs in Iraq	F	P
1. They are not as much innovative, updated and creative as possible and do not meet the needs of the current century	27	90.00%
2. These programs are more theory-based not practice-based	25	83.33%
3. These programs are too much cost-effective	24	80.00%
4. There are budget constraints or lack of school and university budgets to support teachers	24	80.00%
5. They are not high-qualified programs and are not hold by experts and experienced teachers	22	73.33%
6. They are not based on pre-conducted need analysis of the teachers	18	60.00%
7. They do not include educational and ICT technologies into their programs	16	53.33%
8. They do not encourage collaboration among teachers	16	53.33%
9. They do not include support systems for the teachers	15	50.00%
10. Teachers' participation in TPD programs is no obligatory and their participation is not valued upon.	14	46.66%
11. They are not held periodically and in a sustainable way	12	40.00%

The features of a good TPD programs

Content and thematic analysis of the participants' responses resulted in the extraction of fifteen characteristics proposed by Iraqi ELT teachers as features of a good TPD program. As indicated in Table 7, all participants mentioned that being up-to-date and taking into account the immediate needs of both teachers and students as the first feature of a good TPD program (100%). The second feature referred to by almost all of the participant (96.66%) was the importance of the programs to be based on the latest trends and innovations in the field which is in close relation with the first characteristic. After the first and second characteristics, being coherent with international standards (93.33%), including instructions about educational and ICT technologies (93.33%), providing sufficient opportunities to increase subject-specific knowledge (93.33%) and to develop teaching skills, methodologies, and practices (93.33%) were pointed out by nearly all participants. In addition, more than three-fourth of the participants stated that having periodic observations of and feedback provisions for the teachers' classes (86.66%) is the seventh characteristics of a good TPD program, followed by being planned and implemented periodically and in a sustainable way (83.33%), being based on the particular context of Iraq (76.66%), being in complete coherence with the cultural context of Iraq (73.33%) and being practical in nature and connect theories to the practice (73.33%) were mentioned respectively as eighth, ninth, tenth, and eleventh, respectively. Four more features were also referred to by Iraqi ELT teachers as follows: including support systems for the teachers (70.00%), providing collaboration among national and international teachers, experts and higher order specific educational departments (66.66%) and to connect with international teachers and experts in the field (63.33%). Providing opportunities for collegial and collaborative exchanges was also reported as the last feature by more than half of the participants (56.66%).

Table 7. *List of Features of a Good TPD Programs*

Features of a good TPD programs	F	P
1. Be up-to-date and take into account the immediate needs of both teachers and students	30	100%
2. Be based on the latest trends and innovations in the field	29	96.66%
3. Be coherent with international standards	28	93.33%
4. Include instructions about educational and ICT technologies	28	93.33%
5. Provide sufficient opportunities to increase subject-specific knowledge	28	93.33%
6. Provide sufficient opportunities to develop teaching skills, methodologies, and practices	28	93.33%
7. Include periodic observations and feedback provisions of the teachers' classes	26	86.66%
8. Be planned and implemented periodically and in a sustainable way	25	83.33%
9. Be based on the particular context of Iraq	23	76.66%
10. Be based on and in complete coherence with the cultural context of Iraq	22	73.33%
11. Be practical in nature and connect theories to the practice	22	73.33%
12. Include support systems for the teachers	21	70.00%
13. Provide collaboration among national and international teachers, experts and higher order specific educational departments	20	66.66%
14. Provide opportunities to connect with international teachers and experts in the field	19	63.33%
15. Provide opportunities for collegial and collaborative exchanges	17	56.66%

Qualitative analysis

The areas of TPD

As indicated in Table 8, content and thematic analysis of the participants' responses resulted in the extraction of ten areas in which Iraqi EFL teachers want to develop themselves in professionally. As illustrated, almost all of the participants want to renew their themselves with international standards and upgrade their knowledge and skills in conjunction with the teachers' and students' needs in the current century (96.66%). In addition, 90% of them want to up-to-date their subject-specific knowledge (90%), and 86.66% of them want to up-to-date their language-related knowledge and skills. In the same vein, 83.33% of them want to improve their language teaching knowledge, including language teaching methodology and evaluation. In addition, 80% want to not only get acquainted with different educational technologies but also to learn how to use them in language classes. In addition, about three-third of the participants (76.66%) want to become a professional in person and online language teacher, followed by 73.33% of them who are willing to increase their knowledge of classroom management strategies. In the same vein, more than half of the participants want to be in contact with other colleagues and experts in the field (66.66%), followed by 63.33% of the participants who want to be observed with experts in the field and receive their feedbacks and 60% of them who want to have the chance to practice what they have learned in the classrooms.

Table 8. *List of the areas in which ELT Iraqi teachers want to develop themselves professionally*

Areas in which ELT Iraqi teachers want to improve in	F	P
1. They want to renew their themselves with international standards and upgrade their knowledge and skills in conjunction with the teachers' and students' needs in the current century	29	96.66%
2. They want to up-to-date their subject-specific knowledge	27	90.00%
3. They want to up-to-date their language-related knowledge and skills	26	86.66%

4.	They want to improve their language teaching knowledge, including language teaching methodology and evaluation	25	83.33%
5.	They want to get acquainted with different educational technologies and learn how to use them in language classes	24	80.00%
6.	They want to be provided to become a professional in person and online language teacher	23	76.66%
7.	They want to increase their knowledge of classroom management strategies	22	73.33%
8.	They want to be in contact with other colleagues and experts in the field	20	66.66%
9.	They want to be observed with experts in the field and receive their feedbacks	19	63.33%
10.	They want to have the chance to practice what they have learned in the classrooms	18	60.00%

Discussion

The results indicated that the highest mean value was related to the teachers' content knowledge, followed by pedagogical knowledge and pedagogical content knowledge. On the other hand, the lowest mean values were observed for Technological, Pedagogical, Content Knowledge and Technological Pedagogical Knowledge. These findings suggest that pre-service Iraqi ELT teachers may need to enhance their technology-based knowledge.

The results showed that the highest mean values were related to the teachers' presentation skills, followed by classroom climate control skills and assessing students' progress skills. Conversely, the lowest mean values were observed for planning and preparation skills, critical thinking skills, and reflection and self-evaluation skills. These findings suggest that pre-service teachers may need to further develop their planning and preparation abilities, critical thinking skills, and self-evaluation practices. The results indicated that the highest mean values were related to the pedagogies of TPD program, followed by the institutional forms of delivery in TPD program and the concept of TPD program. These findings suggest that pre-service teachers highly value the pedagogical approaches used in TPD programs, as well as the institutional structures supporting these programs.

The analysis of interview comments revealed that Iraqi ELT teachers proposed a total of ten different professional development programs. The most commonly suggested program was the organization of periodic and continuous innovative conferences, seminars, workshops, and short courses to renew teachers' knowledge and skills. This indicates that teachers recognize the importance of staying updated and continuously improving their professional competencies.

Furthermore, the teachers recommended the implementation of up-to-date programs and courses that align with the needs of both teachers and students in the 21st century. This highlights the teachers' awareness of the evolving educational landscape and the necessity of adapting teaching practices to meet the changing demands of the modern era.

Promoting teachers' subject matter knowledge was proposed by high percent of the teachers, indicating the importance of deepening content knowledge to enhance instructional effectiveness. Additionally, the teachers suggested short and periodic courses to develop teachers' technical and practical knowledge and skills, as well as to improve their teaching practices, methodologies, and styles. This reflects the teachers' desire for targeted professional development opportunities that address specific areas of improvement.

Renewing language skills and subskills through short and periodic courses was proposed by most of the teachers, emphasizing the significance of maintaining strong language proficiency for effective language instruction. Moreover, the teachers recommended training workshops to familiarize teachers with different educational and ICT technologies and to guide them on integrating these technologies into language classrooms. This highlights the teachers' recognition of the role of technology in enhancing teaching and learning experiences.

Less frequently suggested programs included periodic instructional courses based on teachers' needs analysis and periodic courses where good classroom practices of other teachers are shared. These recommendations indicate the teachers' interest in personalized professional development that addresses their specific needs and the value they place on learning from the experiences of their peers.

Overall, the findings demonstrate that Iraqi ELT teachers propose a range of professional development programs that emphasize continuous learning, updating knowledge and skills, promoting subject matter expertise, and integrating technology into teaching practices. These recommendations can inform the design and implementation of effective TPD programs in Iraq, catering to the specific needs and aspirations of ELT teachers.

The results of the study indicate several challenges related to Teacher Professional Development (TPD) programs in Iraq. Participants expressed dissatisfaction with the lack of innovative and updated TPD programs. This aligns with the need for dynamic and forward-thinking approaches to professional development that meet the demands of the current century. This suggests a desire for more dynamic and forward-thinking approaches to professional development that align with the rapidly evolving educational landscape. A study by Al-Musawi (2019) supports this finding, highlighting the importance of incorporating innovative practices in TPD programs to enhance teachers' skills and knowledge.

Teachers reported that TPD programs in Iraq are more theory-based than practice-based. This suggests a need for more hands-on and practical training that directly translates into effective teaching practices. A study by Al-Khlaifat (2018) emphasizes the importance of bridging the theory-practice gap in TPD programs to enhance teachers' classroom practices. Financial limitations and inadequate support from schools and universities were identified as challenges. Adequate funding and resource allocation are crucial for the successful implementation of high-quality TPD programs. A study by Al-Musawi (2019) highlights the impact of budget constraints on the quality and effectiveness of TPD programs in Iraq.

Participants expressed concerns about the quality of TPD programs, emphasizing the need for programs facilitated by experts and experienced teachers. This highlights the importance of ensuring that TPD programs are delivered by individuals with the necessary expertise and practical knowledge. A study by Al-Khlaifat (2018) emphasizes the role of qualified facilitators in enhancing the quality of TPD programs. The absence of pre-conducted needs analysis of teachers was mentioned as a challenge. This indicates a desire for TPD programs that are tailored to the specific needs and requirements of teachers. A study by Al-Musawi (2019) emphasizes the importance of conducting needs assessments to design effective TPD programs that address teachers' specific needs.

Participants reported that TPD programs in Iraq do not adequately incorporate educational and ICT technologies. This suggests a need for TPD programs to address the integration of technology into teaching practices. A study by Kasi et al., (2022) highlights the importance of integrating technology in TPD programs to enhance teachers' digital literacy skills. Collaboration among teachers was identified as a challenge, with participants expressing a desire for TPD programs that foster collaboration and networking opportunities. Al-Musawi (2019) emphasizes the importance of creating a supportive professional community that encourages knowledge sharing and collaboration among teachers.

Participants mentioned the absence of support systems for teachers within TPD programs. This indicates a need for comprehensive support structures that provide ongoing guidance, mentorship, and resources to teachers throughout their professional development journey. In their study, Al- Kasi et al., (2022) highlight the importance of providing continuous support to teachers in TPD programs. Participants reported that teachers' participation in TPD programs is not obligatory and not valued. This suggests a lack of recognition and incentives for teachers to actively engage in professional development activities. Al-Musawi et al. (2019) emphasizes the importance of recognizing and valuing teachers' participation to enhance their motivation and commitment to professional growth. Participants expressed that TPD programs are not held periodically and in a sustainable manner. This highlights the importance of establishing a consistent and sustainable framework for TPD programs, ensuring that teachers have access to ongoing professional development opportunities. Tran et al. (2018) emphasizes the need for continuous and sustainable TPD programs to support teachers' professional growth.

The participants stressed the need for TPD programs to be current and responsive to the immediate needs of teachers and students. This indicates the importance of addressing present educational challenges and customizing the program to meet the specific requirements of the Iraqi teachers and students. Additionally, the participants highlighted the importance of incorporating the latest trends and innovations in the field into TPD programs. This underscores the significance of integrating cutting-edge practices and methodologies to ensure the program's relevance and effectiveness. Moreover, the majority of participants emphasized the alignment of TPD programs with international standards, indicating the recognition of the value of aligning professional development with global educational benchmarks. The participants also emphasized the inclusion of educational and ICT technologies in TPD programs, reflecting the growing importance of technology in education and the need for teachers to acquire the necessary skills to effectively integrate technology into their teaching practices. Furthermore, the participants emphasized the practical nature of TPD programs and the connection between theory and practice. This indicates a desire for hands-on and applicable professional development experiences that directly impact classroom instruction. The participants also highlighted the importance of support systems in TPD programs, emphasizing the need for ongoing guidance, mentorship, and resources to support teachers' professional growth. Additionally, the participants stressed the significance of collaboration among national and international teachers, experts, and educational departments. This highlights the value of networking and knowledge-sharing among professionals in the field. Lastly, the participants emphasized the need for TPD programs to provide opportunities for connecting with

international teachers and experts, exposing participants to diverse perspectives and best practices from around the world.

Iraqi English Language Teaching (ELT) teachers have expressed their aspirations for professional growth in various areas. These include aligning their knowledge and skills with international standards and the demands of the current century, as well as staying updated and relevant in their field. The participants' strong motivation to improve themselves professionally was evident throughout the study.

One of the key areas identified by the participants is the need to update their subject-specific knowledge. They recognize the importance of staying informed about the latest developments and research in their respective subjects to enhance their teaching effectiveness and provide accurate information to their students.

Additionally, the participants expressed a desire to enhance their language-related knowledge and skills, including language teaching methodologies and evaluation techniques. By improving their understanding in these areas, they aim to create a more engaging and effective learning environment for their students. The study also revealed the participants' interest in integrating educational technologies into their language classes. They seek to familiarize themselves with different educational technologies and learn how to effectively incorporate them into their teaching practices, acknowledging the role technology can play in enhancing language learning experiences.

Another important area identified by the participants is the desire to become proficient in both in-person and online language teaching. They recognize the growing importance of online teaching and the need to adapt to the changing educational landscape, aiming to provide quality education to a wider range of students.

The findings also highlight the participants' interest in improving their classroom management strategies. They acknowledge the significance of creating a positive and conducive learning environment, and by enhancing their classroom management skills, they aim to create a more organized and engaging learning environment for their students.

Furthermore, the participants expressed a desire to connect with colleagues and experts in the field, recognizing the value of professional networking and collaboration. By engaging with others in their field, they can exchange ideas, share experiences, and stay updated on the latest trends and practices in ELT. The participants also expressed a desire to be observed by experts in the field and receive constructive feedback. They understand the importance of continuous professional development and value feedback as a means to improve their teaching practices.

Lastly, the participants emphasized the importance of having opportunities to practice and implement what they have learned in the classrooms. They recognize the significance of applying theoretical knowledge in real-life teaching situations, as it allows them to enhance their teaching skills and gain confidence in their abilities.

Conclusion

This study aimed to assess how Iraqi ELT teachers evaluate the quality of TPD Programs in Iraq. The findings emphasized the importance of updating technology-based knowledge, enhancing planning and preparation skills, critical thinking skills, and self-evaluation practices for pre-service teachers. Additionally, the significance of pedagogical approaches and institutional support in TPD programs is recognized. These findings can guide the development and enhancement of Pre-service TPD Programs in Iraq, ultimately improving the quality of English language teaching in the country.

Furthermore, the findings suggested that Iraqi ELT teachers recommend various professional development programs that prioritize continuous learning, knowledge and skills updates, subject matter expertise, and technology integration in teaching practices. These recommendations can inform the design and implementation of effective TPD programs in Iraq, tailored to the specific needs and aspirations of ELT teachers.

Moreover, the study revealed several challenges faced by Iraqi ELT teachers in participating in TPD programs. These challenges include the need for innovative and updated programs, practical application focus, addressing budget constraints, ensuring high-quality facilitation, conducting needs analysis, integrating educational and ICT technologies, fostering collaboration, providing support systems, valuing teachers' participation, and establishing sustainable program structures. Addressing these challenges can enhance the effectiveness and impact of TPD programs in Iraq, promoting the professional growth and development of ELT teachers.

Additionally, the findings shed light on the characteristics of a good TPD program from the perspective of Iraqi ELT teachers. These characteristics highlight the importance of addressing immediate needs, incorporating the latest trends and innovations, aligning with international standards, integrating educational and ICT technologies, providing subject-specific knowledge and teaching skills development, offering observation and feedback mechanisms, ensuring sustainable planning and implementation, considering the local and cultural context, connecting theories to practice, providing support systems and collaboration opportunities, and fostering collegial and collaborative exchanges. These findings can guide the design and implementation of effective TPD programs that cater to the specific needs and aspirations of Iraqi ELT teachers.

Overall, the findings of this study underscored the strong motivation of Iraqi ELT teachers for professional development and their recognition of the need for continuous improvement in their knowledge and skills. The identified areas for improvement provide valuable insights for educational institutions and policymakers to design targeted professional development programs that support the specific needs of these teachers.

References

Ackland, R. (2000). A review of the peer coaching literature. *The Journal of Staff Development*, 12(1), 22–27.

Al-Mahrooqi, I. R. (2011). EFL student teacher perceptions of the teaching practice program at SQU. *AWEJ*, 2(2), 243-266.

Al Musawi, A., Al-Ani, W., Al-Barwani, T., Amoozegar, A., & Al-Abri, K. (2022). Preservice Teachers' Beliefs and Practices of Educational Diversity in the Sultanate of Oman. *The International Journal of Diversity in Education*, *23*(1), 1. http://dx.doi.org/10.18848/2327-0020/CGP/v23i01/1-23

Al-Ustath., F. M.-. (2016). Evaluating the Reality of Iraqi EFL In-service Teacher Training Courses from the Perspective of Trainees Inst. Fakhir Muhi Mahmood Ph. D. Ministry of Education / General Directorate of Pre-service and In-service Training and Educational Development. 1–8.

Aliakbari, M., & Hasoon, A. M. (2022). The Relationship between Iraqi EFL Teachers' Professional development and Their Classroom Management. 2005–2003 ,8.5.2017 ,הארץ.

Altae, M. (2020). An overview of the stages of development of the Iraqi English language curriculum. Social Sciences & Humanities Open, 2(1), 100047. https://doi.org/10.1016/j.ssaho.2020.100047

AL- Wreikat, S.Y. & Abdullah, K.M. (2011). Effectiveness of teaching approaches of in-service training courses for EFL teachers in Jordanian schools. *English Language Teaching*, 4(1), 190-196 http://dx.doi.org/10.5539/elt.v4n1p190.

Anderson, S. E., & Maninger, R. M. (2007). Pre-service teachers' abilities, beliefs, and intentions regarding technology integration. *Journal of Educational Computing Research*, 37(2), 151-172 http://dx.doi.org/10.2190/H1M8-562W-18J1-634P

Atkins, N. E. & Vasu, E. S. (2000). Measuring knowledge of technology usage and stages of concern about computing: A study of middle school teachers. *Journal of Technology and Teacher Education*, 8(4), 279–302.

Avalos, B. (2011). Teacher professional development in teaching and teacher education over ten years. *Teaching and Teacher Education*, 27(1), 10-20. https://doi.org/10.1016/j.tate.2010.08.007

Bakker, A. B., & Bal, P. M. (2010). Weekly work engagement and performance: A study among starting teachers. *Journal of Occupational and Organizational Psychology*, 83(1), 189-206. http://dx.doi.org/10.1348/096317909X402596

Barth, R. S. (2006). Improving relationships within the schoolhouse. *Educational Leadership*, 63 (6), 8 13.

Begeny, J. C. & Martens, B. K. (2006). Assessing pre-service teachers' training in empirically validated behavioral instruction practices. *School Psychology Quarterly*, 21, 262-285. http://dx.doi.org/10.1521/scpq.2006.21.3.262

Beh-Afarin, R.S. (2007). EFL teacher development in Iran. *ILI Language Teaching Journal*, 3(1), 33-50.

Borg, S. (2003). Teacher cognition in language teaching: A review of research on what language teachers think, know, believe, and do. *Language Teaching*, 36, 81-109. http://dx.doi.org/10.1017/S0261444803001903

Borg, S. (2011). *Language Teacher Education. In Simpson*, J. (Ed.), The Routledge handbook of applied linguistics (pp. 215-228). Routledge.

Boud, D. & Brew, A. (2013). Reconceptualising academic work as professional practice: Implications for academic development. *International Journal for Academic Development*, 18(3), 208–221. http://dx.doi.org/10.1080/1360144X.2012.671771

Brouwer, N., & Korthagen, F. (2005). Can teacher education make a difference? *American Educational Research Journal*, 42 (1), 153-224. http://dx.doi.org/10.3102/00028312042001153

Cajkler, W., Wood, P., Norton, J., Pedder, D., & Xu, H. (2015). Teacher perspectives about lesson study in secondary school departments: a collaborative vehicle for professional learning and practice development. *Research Papers in Education*, 30(2), 192-213. http://dx.doi.org/10.1080/02671522.2014.887139

Cilliers, F. J. & Herman, N. (2010). Impact of an educational development programme on teaching practice of academics at a research-intensive university. *International Journal for Academic Development*, 15(3), 253–267. http://dx.doi.org/10.1080/1360144X.2010.497698

Cirino, P. T., Pollard-Durodola, S. D., Foorman, B. R., Carlson, C. D., & Francis, D. J. (2007). Teacher characteristics, classroom instruction, and student literacy and language outcomes in bilingual kindergartners. *The Elementary School Journal*, 107(4), 341–364. http://dx.doi.org/10.1086/516668

Clair, N. (1998). Teacher study groups: Persistent questions in a promising approach. TESOL Quarterly, 32(2), 465-492.

Coiro, J. (2005). Making sense of online text. Educational Leadership, 63(2), 30 - 35.

Collins, M. (1991). *Adult education as vocation, a critical role for the adult educator*. Routledge.

Cooper, K. S. (2013). Eliciting engagement in the high school classroom: a mixed-methods examination of teaching practices. *American Educational Research Journal*. 51(2), 363-402 http://dx.doi.org/10.3102/0002831213507973

Corcoran, T. B. (1995). *Transforming professional development for teachers: A guide for state policymakers*. National Governors' Association.

Crawford, M. & Earley, P. (2011) Personalised leadership development? Lessons from the pilot NPQH in England, *Educational Review*, 63(1), 105-19. http://dx.doi.org/10.1080/00131911.2010.517606

Dallmer, D. (2004). Collaborative relationships in teacher education: A personal narrative of conflicting roles. *Curriculum Inquiry*, 34(1), 29–45. http://dx.doi.org/10.1111/j.1467-873X.2004.00279.x

Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualization and measures. *Educational Researcher, 38*(3), 181–199. https://doi.org/10.3102/2F0013189X08331140

De Jong, O., & Van Driel, J. (2001). *The development of prospective teachers' concerns about teaching chemistry topics at a macro-micro-symbolic interface*. In H. Behrendt, H. Dahncke, R.

Erlandson, P. (2006). Giving up the ghost: The control-matrix and reflection-in-action. Reflective Practice, 7(1), 115-124. https://doi.org/ 10.1080/14623940500489781

Ermeling, B. A. (2010). Tracing the effects of teacher inquiry on classroom practice. *Teaching and Teacher Education*, 26(3), 377-388. http://dx.doi.org/10.1016/j.tate.2009.02.019

Flores, M.A. (2004). The impact of school culture and leadership on new teachers' learning in the workplace. *International Journal of Leadership in Education*, 7(4), 297-318. http://dx.doi.org/10.1080/1360312042000226918

Frey, N., & Fisher, D. (2009). Using common formative assessments as a source of professional development in an urban American elementary school. *Teaching and Teacher Education*, *25*(5), 674-680. https://doi.org/10.1016/j.tate.2008.11.006

Fullan, M. (2002). The change. *Educational leadership*, 59(8), 16-20.

Guskey, T. R. (2002). Professional development and teacher change. Teachers and Teaching: Theory and Practice, 8(3), 381–391. https://doi.org/10.1080/135406002100000512

Guay, F., Valois, P., Falardeau, É., & Lessard, V. (2016). Examining the effects of a professional development program on teachers' pedagogical practices and students' motivational resources and achievement in written French. *Learning and Individual Differences*, 45, 291-298. https://doi.org/10.1016/j.lindif.2015.11.014

Hill, H. C., Rowan, B., & Ball, D. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Educational Research Journal*, 42, 371-406. https://doi.org/10.3102/00028312042002371

Kasi, Y. F., Widodo, A., Samsudin, A., & Riandi, R. (2022). The Benefits of Teacher Professional Development (TPD) Program Based on Partnership, Technology, and Ethnoscience Approach to Improving the TPACK of Science Teachers. *Pedagonal: Jurnal Ilmiah Pendidikan*, 6(2), 228-237. http://dx.doi.org/10.55215/pedagonal.v6i2.5756

Kavak, N., H. Yamak, S.C. Bilici, E. Bozkurt, O. Darici & Ozkaya, Y. (2012). The evaluation of primary and secondary teachers' opinion about in-service teacher training. 4th World Conference on Educational Sciences (WCES-2012) 02-05. Proceedia: Social and Behavioral Sciences, 46, 3507 – 3511.

Khani R, & Amoli, F. (2016). A Teacher Professional Development Inventory. *ILT Journal*.

Kaya, O. N. (2009). The nature of relationships among the components of pedagogical content knowledge of pre-service science teachers: Ozone layer depletion as an example. *International Journal of Science Education*, 31(7), 961-988. http://dx.doi.org/10.1080/09500690801911326

Lawless, K. A., & Pellegrino, J. W. (2007). Professional development in integrating technology into teaching and learning: Knowns, unknowns, and ways to pursue better questions and answers. *Review of educational research*, 77(4), 575-614. https://doi.org/10.3102/0034654307309921

Levine, T. H., & Marcus, A. S. (2010). How the structure and focus of teachers' collaborative activities facilitate and constrain teacher learning. *Teaching and teacher education*, 26(3), 389-398. http://dx.doi.org/10.1016/j.tate.2009.03.001

Li, R., Liu, H., Chen, Y., & Yao, M. (2022). Teacher engagement and self-efficacy: The mediating role of continuing professional development and moderating role of teaching experience. *Current Psychology*, 41(1), 328-337. https://link.springer.com/article/10.1007/s12144-019-00575-5

Morais, A. M., Neves, I. P., & Alfonso, M. (2005). Teacher training processes and teachers' competence: A sociological study in the primary school. *Teaching and Teacher Education*, 21, 415–437. http://dx.doi.org/10.1016/j.tate.2005.01.010

Nguyen, Y. T. X., Ha, X. V., & Tran, N. H. (2022). Vietnamese primary school teachers' needs for professional development in response to curriculum reform. *Education Research International*, 8(4), http://dx.doi.org/10.1155/2022/4585376.

Opfer, V. D., & Pedder, D. (2011). Conceptualizing teacher professional learning. *Review of Educational Research*, 81(3), 376-407. http://www.jstor.org/stable/23014297

Popova, A., Evans, D. K., Breeding, M. E., & Arancibia, V. (2022). Teacher professional development around the world: The gap between evidence and practice. *The World Bank Research Observer*, 37(1), 107-136. http://dx.doi.org/10.1093/wbro/lkab006

Richards, J. C. (2010). *L ongman LANGUAGE & APPLIED LINGUIsTICs*. In Pearson.

Sancar, R., Atal, D., & Deryakulu, D. (2021). A new framework for teachers' professional development. *Teaching and Teacher Education*, 101 (2), 103305. http://dx.doi.org/10.1016/j.tate.2021.103305

Seymour, J. R., & Osana, H. P. (2003). Reciprocal teaching procedures and principles: Two teachers' developing understanding. *Teaching and Teacher Education*, 19(3), 325-344. http://dx.doi.org/10.1016/S0742-051X(03)00018-0

Stes, A., Min-Leliveld, M., Gijbels, D., & Van Petegem, P. (2010). The impact of instructional development in higher education: The state-of-the-art of the research. *Educational research review*, 5(1), 25-49. http://dx.doi.org/10.1016/j.edurev.2009.07.001

Topkaya, E. Z., & Küçük, Ö. (2010). An evaluation of 4th and 5th grade English language teaching program. *İlköğretim Online*, 9(1), 52-65. http://ilkogretim-online.org.tr/

Tran, N. H., Truong, T. D., Dinh, H.-V. T., Do, L.-H. T., Tran, T.-A. T., & Phan, M.-H. T. (2020). Significance of Teacher Professional Development in Response to the Current General Education Reforms in Vietnam: Perceptions of School Principals and Teachers. *Problems of Education in the 21st Century*, 78(3), 123-137. https://doi.org/10.33225/pec/20.78.449

Uysal, H. H. (2012). Evaluation of an in-service training program for primary-school language teachers in Turkey. *Australian journal of teacher education*, 37(7), 14-29. http://dx.doi.org/10.14221/ajte.2012v37n7.4

Wei, R. C., Darling-Hammond, L., Andree, A., Richardson, N., & Orphanos, S. (2009). Professional learning in the learning profession. *A status report on teacher development in the United States and Abroad. Dallas, Tx: National Staff Development Council*.

Wenglinsky, H. (1997). *When Money Matters: How Educational Expenditures Improve Student Performance and How They Don't*. A Policy Information Perspective.

Yoon, I., & Kim, M. (2022). Dynamic patterns of teachers' professional development participation and their relations with socio-demographic characteristics, teacher self-efficacy, and job satisfaction. *Teaching and Teacher Education*, *109*(1), 103565. http://dx.doi.org/10.1016/j.tate.2021.103565