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A Proposed Program for Professional Development of Science Teachers in Light of Recent Global Trends: A Study According to the Delphi Approach

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This study aimed to identify the elements and components of the proposed induction program for science teachers. The researcher adopted a descriptive-analytical method using Delphi approach and a survey was then validated by eighteen experts in science education on two rounds. The study results indicated that the proposed program includes eighty elements were distributed to eleven components: program assumptions consisted of 4 elements; the starting points of the program consisted of 8 elements; artistic content consisted of 13 elements; the administrative content consisted of 16 elements; training levels and those responsible for it consisted of 3 elements; training techniques consisted of 8 elements; the supervising authorities consisted of 6 elements; the means of communication consisted of 5 elements; promotion consisted of 7 elements; monitoring and evaluation consisted of 7 elements; and training times consisted of 3 elements.

Keywords: *A Proposed Program, Science Teachers, Professional Development Program, and Delphi's Approach.*

Introduction

Many interested people in science education (National Science Teachers Association, 2011; Berry, 2002; Luft et al., 2002; Watson, 2006; Wong, 2004; Luft, et al., 2011; Ismail, Abu Zaid, and Afifi, 2016; Al-Ghamdi, 2014) agree that pre-service science teachers are not sufficient to become successful teachers in performing their educational duties in-service and therefore, they must receive appropriate training immediately upon joining the service. For a

beginner science teacher to be effective and enter the profession properly, they must possess the basic teaching competencies and skills necessary for all teachers, the competencies and skills of science teachers, in addition to the requirements for adaptation at the beginning of the profession.

Science teachers in Jordan are prepared in the Faculties of Science to receive a bachelor's degree in a scientific field (Physics, Chemistry, Biology or Geology), without studying any subjects related to the teaching profession. After that, teachers join schools to teach in the upper basic and secondary stages. They are not required to receive an educational qualification for appointment. To adapt to the new job, the beginner teacher begins using teaching strategies that are centered around the teacher such as explanation and indoctrination, and imitating those who taught him at different stages as a student; hence, getting away from modern student-centered strategies, such as inquiry, critical thinking, and others.

Studies of the teachers' induction programs started simultaneously with the implementation of the beginning teachers' induction programs. Webb (2012) conducted a case study in North Carolina that included four beginner teachers who participated in an induction program for 3 years to get a state education license, and the results of the study were: beginner teachers received training in the topics of classroom management, school rules at the beginning of the academic year; and the topics of asking questions, achieving standards, planning in the middle of the academic year, and other topics such as education strategies, defining the required knowledge, evaluation strategies, and educational policies at the end of the academic year. Training took place at the levels including state and school departments on educational policies and administrative procedures and the management of teaching resources; expert teachers to build the educational professionalism of the beginner teacher; and the new fellow teachers shared and discussed experiences and challenges they faced.

After reviewing the educational literature in the field of induction programs for science teachers, McBride (2012) concluded that 60% of these programs include classroom management and discipline, curriculum design and teaching planning; 58% of them include professional development, and 50% of the beginner teachers considered the principal and colleagues support among the most important components of the program.

Finally, Saka, et al. (2013) conducted a study in Turkey aimed at identifying the available factors in the induction programs that help science teachers enter the teaching profession smoothly and effectively. The researchers used descriptive notes, questionnaires, interviews and document analysis to get data that lasted for two years. The findings of the study indicated that the induction programs for science teachers should include facilitating the

integration of the teacher into the teaching profession, the school community, developing educational practices, and generating sound professional convictions about teaching.

This study joins with earlier studies in the efforts made to decide the best characteristics for the programs of the induction for beginning science teachers, furthermore, this study differs from others in the diversity of the components of the proposed induction program to include its assumptions; premises; artistic and administrative content; levels; evaluation; methods; means of communication in it and the roles of both expert teachers and school administrators and supervisors; where the earlier studies did not classify the program into specific components; however, they rather mentioned its components directly. Further, they differ in that the proposed program fits an educational system in one of the developing countries with a different culture seeking to develop its educational system.

Study Problem and Questions

In Jordan, about 800 science teachers are appointed annually to teach in the basic and secondary stages. With the start of the academic year, those teachers take part in training programs on the fundamentals of educational work necessary to start work. This program targeted the dimensions of professional development for beginners and in-service teachers.

By exploring the perspectives of many beginning teachers who participated in the various teacher training programs, they indicated that these programs do not meet their professional and practical needs on the one hand and that the time, place, and the mechanism for presenting the programs are inappropriate, and their goals are not achieved on the other. The researcher also noticed the negative trends of science teachers towards this training.

One of the indications and evidence for the need to review science education in Jordan of a review indicated by the findings of some international studies to evaluate the performance of Jordan students in science. The findings of TIMSS for the year 2015 and Program for International Student Assessment (PISA, 2015), confirmed that education in Jordanian schools still tends to teach students how to memorise and recall information, and does not care much about providing students with problem-solving skills and critical thinking. This, of course, is a major challenge for the implementers of the curricula and requires verification of the teaching methods used and their ability to enhance students' higher thinking skills.

In the context of explaining the weakness and retreat in the findings of the TIMSS study for the 2015 session indicated a defect in the implementation of the curricula, poor teaching activities, and practices, as well as methods of evaluation they emphasised that the Jordanian teacher does not take into account in his teaching the needs of students and the differences among them. The study considered that teachers' practices are unsuccessful in improving

students' performance, and focused on teachers not taking into account the diversity of activities; even the activities used by teachers are still cantered on the theoretical knowledge of things, focusing on delivering knowledge in traditionally, indoctrinating rules and urging storing them (Bawaneh, 2019).

This study came to propose a theoretical program of induction training for science teachers. It is hoped that it will help improve the level of performance of science teachers, keep them, meet the conditions for practicing the education profession, unify the efforts of training science teachers in Jordan, and raise the efficiency of the educational system. Specifically, this study aimed to answer the following question:

"What is the proposed program for induction training for science teachers in Jordan?" This question is divided into the following questions:

The first question: What are the characteristics of induction programs for science teachers globally?

The second question: What are the components of the proposed program for promoting science teachers in Jordan?

The third question: What are the elements of the proposed program for promoting science teachers in Jordan?

Study Methodology

The researcher adopted the descriptive and analytical approach to achieving the research goals, by analysing the content of educational literature and the most important induction training programs for science teachers in the world and earlier studies. Relevant knowledge was gathered, and conclusions and generalisations related to the question of the first study on the most important components of the proposed induction program for science teachers. Then the Delphi technique was used, where the program for preparing beginner science teachers in Jordan was identified and described by presenting the proposed program reached a group of experts of science teachers' education. Their views were investigated on two rounds to reach a majority agreement on the components of the proposed program for the program and its components.

Study Population and Sample

The study population consisted of Jordanian experts in teaching and training science teachers. The sample of experts was chosen from professors specialising in science education and

practitioners in training teachers and educational supervisors for science in an available way. The number of the sample members reached 18 experts, distributed as in Table (1):

Table 1: Distribution of the Study Sample

The nature of dealing	Number
Academic	5
Supervisory	8
training	5
Total	18

Where the academics are represented by university professors who specialise in curricula and teaching sciences at Jordan Universities. The educational supervisors of science in the directorates of education in Amman. The trainers were represented by the members of ChangeAgent for Arab Development and Education Reform (*CADER*), and the Queen Rania Teacher Academy (QRTA).

Study Instrumentation

After reviewing the literature related to the training programs for science teachers, the study instrument was prepared, which is a questionnaire that initially included the ten basic components of the program, and the elements of each component with total number 77 elements.

Validity and Reliability of the Instrument

The instrument was validated by presenting it to 12 specialists in preparing science teachers, training and educational supervision to express their opinions, comments, and recommendations about the components and elements of the initial program. The experts suggested adding a new component, "training times", developed 7 elements, and modifying the name in the second component from "designing the training program" to "the starting points of the training program", adding 9 elements, most of them related to science teaching environment in Jordan, and the new component "training times", omitting 4 elements, and separating each of two elements into two others.

The reliability of the instrument was confirmed by an internal consistency method according to the Alpha-Cronbach equation, as it reached 0.86 for the instrument as a whole. Thus, the study instrument consisted of eleven components and 84 elements, which are:

1. Program assumptions: 6 elements;

2. The starting points of the program: 8 elements;
3. Artistic content: 14 elements;
4. The administrative content: 17 elements;
5. Training levels and those responsible for it: 3 elements;
6. Training methods: 8 elements;
7. The supervising authorities: 6 elements;
8. The means of communication: 5 elements;
9. Enhancement: 7 elements;
10. Monitoring and evaluation: 7 elements; and
11. Training times: 3 elements.

The Likert triple scale was used to determine the experts' opinions on the proposed program components and elements, where the alternatives consisted of: agree, hesitant, disagree; and grades given were: 3, 2, and 1 respectively.

Study Procedures

The first round: Each expert was asked to decide his opinion on the program components and the elements of each component by choosing one of the alternatives (agree, hesitant, disagree). Their responses were blanked in tables showing the frequency of each alternative, its percentage, mean, and SD for each element.

The second round: The elements that won the approval of the majority of the experts were identified, and the elements that did not receive the approval of the majority and in which the opinions were between "hesitant" or "disagree", then the proposed program was sent back to the experts whose opinions conflicted with the opinion of the majority. It included "hesitant" or "disagree", and each of the experts was asked to do one of the following procedures:

The first: A review of his opinion to conform to the views of the majority.

The second: Mentioning the reasons that made him insist on his earlier opinion "hesitant" or "disagree."

- Determining the components of the proposed program and the elements of each component according to the standard adopted in this study.

Statistical Means

To answer the second and third questions, a descriptive statistic was used, including frequencies, percentages, mean, and SD. To determine the elements that deserve to be in the proposed program, the following criterion was adopted: the elements that deserve to be within the proposed program are those that the percentages of experts' approval of them exceeded 80%, i.e. the approval of 15 experts or more, and this criterion was adopted by other researchers Al-Sirhan (2008).

Study Findings and Discussion

To answer the first question: What are the characteristics of induction programs for science teachers globally?

The content of theoretical literature, earlier studies, and international programs related to the education of science teachers was analysed, including the Support Program for Science teachers in Arizona (ASIST), the Montana State Science Teachers Excellence Program (STEP), the Training Program for Beginning Mathematics Teachers in Texas (TENET), the induction program for science teachers at Weber University, and the induction program for science teachers in Germany. After the analysis, the proposed program in its beginning form was reached. It included ten components and each component contained a total of 77 elements, as explained earlier.

To Answer the Second Third Questions:

The second question: What are the components of the proposed program for promoting science teachers in Jordan?

The third question: What are the elements of the proposed program for promoting science teachers in Jordan?

The Delphi approach was used in two rounds, as follows:

The First Round

The study instrument was presented to the group of experts to take their views on the components of the proposed program and the elements of each component, then the frequencies, percentages, the mean and SD for each component were calculated, and the tables (2 - 12) indicated the results:

Components of the proposed program

All components of the proposed program have won the approval of the experts, and therefore the components of the proposed program for the induction of science teachers in Jordan are: 1. The program assumptions, 2. Starting points, 3. Technical content, 4. Administrative, 5. Training levels and those responsible for it. 6- Training methods, 7. Supervising authorities, 8. Means of communication, 9. Enhancement, 10. Monitoring and evaluation, 11. Training times. This result is similar in its components and elements with all earlier studies, for example, the study of Luft and Cox (1998) is similar in the assumption that induction programs are not sufficient, and with the study of Davis, et.al. (2006) in the components and elements: scientific content for topics in science, and teaching strategies. This similarity may be because the subjects of science are similar in all countries of the world and are slightly affected by the nature of society and its experience in education, and differ from it by classifying the elements into main components.

Elements Relating to Each of the Components of the Program

Each component included a set of elements that reflect its nature. All of the components of the instrument received a large approval (2,33 - 3.00) for the total experts, where it's means ranged between full approval of thirty-three elements and great approval for the rest of the elements. The hereunder is a presentation of the findings of the study in the first round, according to the program components:

Assumptions: This component includes 6 elements, and table 2 shows the frequencies, percentages, mean, and standard deviation for each element in this component.

Table 2: Frequencies, Percentages, Mean and SD in the 1st Round of the first component: *Assumptions*

No	Element	Alternatives						Mean	SD
		Agree		Hesitant		Disagree			
		F	%	F	%	F	%		
1	The earlier preparation of science teachers was insufficient to be a good teacher	15	83	2	11	1	6	2.78	0.55
2	Induction training for beginning teachers is a changing process	12	67	3	17	3	17	2.5	0.79
3	Induction training, developmental at the level of the teacher within the educational system	15	83	3	17	0	0	2.94	0.38
4	The induction training will bring about desired changes in the cognitive, skill and value aspects of the beginning teacher	17	94	1	6	0	0	2.94	0.24
5	The induction program lasts for at least one academic year	12	67	3	17	3	17	2.5	0.79
6	The program ends with the decision of the teacher to enter the educational system as a science teacher or not	18	100	0	0	0	0	3.00	0.00

It is noticed from Table 2 that all the elements received great approval and element 6 was agreed by all experts. While for the other elements, the opinions of some experts on them were "hesitant" or "disagree."

1- **The starting points of the program:** This component included 8elements; and table 3 shows the frequencies, percentages, mean, and standard deviation for each element in this component.

Table 3: Frequencies, Percentages, Means, and SD in the 1st Round of the Second Component: *Basics*

No	Element	Alternatives						Mean	SD
		Agree		Hesitant		Disagree			
		F	%	F	%	F	%		
1	Induction training programs for science teachers in the world	18	100	0	0	0	0	3.00	0.00
2	National and global standards for teachers in general and science teachers in particular	18	100	0	0	0	0	3.00	0.00
3	The professional needs of beginning teachers	17	94	1	6	0	0	2.94	0.23
4	Deficiencies revealed by the reports of school principals and educational supervisors on the performance of beginning teachers in Jordan	15	83	2	11	1	6	2.78	0.55
5	The shortcomings of national and international studies in the achievement of students in sciences such as my study (TIMSS) and (PISA)	18	100	0	0	0	0	3.00	0.00
6	Reasons why many science teachers refuse to be hired in the teaching profession	17	94	0	0	1	6	2.89	0.47
7	Reasons why many science teachers are applying for early resignation from the profession and moving to other professions	17	94	0	0	1	6	2.89	0.47
8	Requirements of educational development projects in Jordan	17	94	1	6	0	0	2.94	0.24

It is noticed from Table 3 that all the elements received great approval, and elements 1, 2 and 5 received the approval of all experts, while the other elements were the opinions of some experts on it “hesitant” or “disagree”.

2- The Technical content: This component included 14 elements and Table 4 shows the frequencies, percentages, mean, and standard deviation for each element in this component.

Table 4: Frequencies, Percentages, Mean, and SD in the 1st Round of the Third Component: *Technical Content*

No	Element	Alternatives						Mean	SD
		Agree		Hesitant		Disagree			
		F	%	F	%	F	%		
1	Integrated planning for teaching, including the formulation of learning outcomes, teaching strategies, evaluation strategies and tools appropriate to the subject of the lesson	17	94	1	6	0	0	2.94	0.24
2	Building and updating the curriculum (paper and computerised form) from the scientific and educational sides	17	94	0	0	1	6	2.89	0.47
3	Building a teacher-specific theory of science teaching	11	61	2	11	5	28	2.33	0.91
4	Facilitating student self-learning	16	89	2	11	0	0	2.89	0.32
5	Providing the appropriate conditions to generate creativity for students	18	100	0	0	0	0	3.00	0.00
6	Expansion of the scientific content of some of the vocabulary of the curriculum	13	72	4	22	1	6	2.67	0.59
7	Evaluating the textbook, developing, amending and analysing of its content	17	94	0	1	0	6	2.89	0.47
8	Arousing student motivation to learn	18	100	0	0	0	0	3.00	0.00
9	Integrating ICT in science education	16	89	2	11	0	0	2.89	0.32
10	Know the sources of teaching science	15	83	3	17	0	0	2.83	0.38
11	Mastering the various teaching strategies, especially the survey	18	100	0	0	0	0	3.00	0.00
12	Assessing student achievement with different assessment strategies and tools	16	89	2	11	0	0	2.89	0.32
13	Understanding the ethical and religious considerations associated with controversial scientific topics	16	89	1	6	1	6	2.83	0.51

14	Knowledge of science philosophy and history	18	100	0	0	0	0	3.00	0.00

It is noticed from Table 4 that all of the elements received the great agreement, and elements 5, 8, 11 and 14 received the agreement of all experts. As for the other elements, the opinions of some experts were “hesitant” or “disagree."

3- **Administrative content:** This component contains 17elements, and table 5 shows the frequencies, percentages, mean, and standard deviation for each element in this component.

Table 5: Frequencies, Percentages, Mean and SD in the 1st Round of the Fourth Component: *Administrative Content*

No	Element	Alternatives						Mean	SD
		Agree		Hesitant		Disagree			
		F	%	F	%	F	%		
1	Managing the educational situation inside and outside the classroom	17	94	0	0	1	6	2.89	0.47
2	Providing a safe environment for student learning, especially laboratories	16	89	1	6	1	6	2.72	0.67
3	Managing activities that accompany the curriculum, such as laboratories, science clubs, excursions and exhibitions	13	72	3	17	2	11	2.6	0.70
4	Achieving student discipline	17	94	0	0	1	6	2.89	0.47
5	Managing student learning time	18	100	0	0	0	0	3.00	0.00
6	Understanding the characteristics and needs of the stages of childhood (adolescence and adolescence).	17	94	0	0	1	6	2.89	0.47
7	Familiarizing with the administrative procedures followed in the school, the educational district, and the Jordanian educational system	18	100	0	0	0	0	3.00	0.00
8	Knowing the educational policies used in the school, and the Jordanian educational system	18	100	0	0	0	0	3.00	0.00
9	Social inclusion of beginning teachers	18	100	0	0	0	0	3.00	0.00
10	Professional integration of beginning teachers	18	100	0	0	0	0	3.00	0.00
11	Localising of the concept of organizational learning for beginning teachers	18	100	0	0	0	0	3.00	0.00
12	Transferring the culture of the educational system to beginning teachers	15	83	2	11	1	6	2.78	0.55
13	Understanding the organisational climate of the Jordanian School	16	89	1	6	1	6	2.83	0.51
14	Knowing the strategic plan for developing education in Jordan	17	94	1	6	0	0	2.94	0.24

15	Communicating with fellow science teachers in the school and other schools	14	78	0	0	4	22	2.56	0.86
16	Knowing the educational laws, regulations and instructions	18	100	0	0	0	0	3.00	0.00
17	Teacher self-assessment	14	78	22	4	0	0	2.78	0.43

It is noticed from Table 5 that all of the elements received the great agreement, and the elements 5, 7, 8, 9, 10, 11 and 16 received the agreement of all experts, while the opinions of some experts on the other elements were "hesitant" or "disagree."

4- Training levels and those in charge of it. This component included 3 elements. Table 6 shows the frequencies, percentages, mean, and standard deviation for each element in this component.

Table 6: Repetitions, Percentages, Means, and SD in the 1st Round of Component Five: *Training Levels*

No	Element	Alternatives						Mean	SD
		Agree		Hesitant		Disagree			
		F	%	F	%	F	%		
1	**Teacher:** Provides little advice, views and exchange visits, provided by the principal, expert teachers, and pedagogical supporters	16	89	2	11	0	0	2.89	0.32
2	**The Education Zone**: Workshops and development for effective teaching are provided by educational supervisors and educational experts	17	94	1	6	0	0	2.94	0.24
3	**The national level**: where educational policies, national standards and plans for educational development are presented and provided by educational leaders	18	100	0	0	0	0	3.00	0.00

It is noticed from Table 6 that all of the elements received the great agreement, and element 3 received the agreement of all experts, while the opinions of some experts on the other two elements were "hesitant".

5- Training methods: This component included 8 elements, and table 7 shows the frequencies, percentages, mean, and standard deviation for each element in this component.

Table 7: Frequencies, Percentages, Mean and SD in the 1st Round of the Sixth Component: *Training Techniques*

No	Element	Alternatives						Mean	SD
		agree		hesitant		disagree			
		F	%	F	%	F	%		
1	Lecturing and group discussions	16	89	2	11	0	0	2.89	0.32
2	Studying training cases	18	100	0	0	0	0	3.00	0.00
3	Noting the quotas between beginning teachers and fellow practitioners	17	94	1	6	0	0	2.94	0.24
4	Participating in lessons planning, implementation and evaluation	18	100	0	0	0	0	3.00	0.00
5	Providing moral support from colleagues and administrators in the school	18	100	0	0	0	0	3.00	0.00
6	Attending conferences and workshops	18	100	0	0	0	0	3.00	0.00
7	Scientific trips	15	83	1	6	2	11	2.72	0.67
8	Social media sites	14	78	3	17	1	6	2.72	0.57

It is noticed from Table 7 that all of the elements received the great agreement, and elements 2, 4, 5 and 6 received the agreement of all experts, while the opinions of some experts on the other elements were "hesitant" or "disagree ".

6- Supervising authorities: This component included 6elements, and table 8 shows the frequencies, percentages, mean, and standard deviation for each element in this component.

Table 8: Frequencies, Percentages, Mean, and SD in the 1st Round of Component Seven: *Supervising Entities*

No	Element	Alternatives						Mean	SD
		Agree		Hesitant		Disagree			
		F	%	F	%	F	%		
1	Colleges of education in local universities	13	72	3	17	2	11	2.61	0.70
2	Teachers Syndicate	14	78	1	6	3	17	2.61	0.78
3	educational departments in the educational areas	18	100	0	0	0	0	3.00	0.00
4	school departments	16	89	1	6	1	6	2.83	0.51
5	expert teachers	16	89	1	6	1	6	2.83	0.51
6	Pedagogical supporters	18	100	0	0	0	0	3.00	0.00

It is noticed from Table 8 that all of the elements received the great agreement, and elements 3 and 6 received the agreement of all experts, while the opinions of some experts on the other elements were "hesitant" or "disagree".

7- Means of Communication: This component included 5 elements and table 9 shows the frequencies, percentages, mean, and standard deviation for each element in this component.

Table 9: Frequencies, Percentages, Mean, and SD in the 1st Round of Component 8: *Communication Methods*

No	Element	Alternatives						Mean	SD
		Agree		Hesitant		Disagree			
		F	%	F	%	F	%		
1	Direct interviews	16	89	0	0	2	11	2.78	0.65
2	Paper and electronic publications	16	89	2	11	0	0	2.89	0.32
3	Internet and e-mail	18	100	0	0	0	0	3.00	0.00
4	Colleagues and social media	16	89	0	0	11	2	2.78	0.65
5	Telephone calls	15	83	1	6	2	11	2.72	0.67

It is noticed from Table 9 that all of the elements received the great agreement, and elements 3 received the agreement of all experts, while the opinions of some experts on the other elements were "hesitant" or "disagree".

8- Enhancement: This component includes 7elements, and table 10 shows the frequencies, percentages, mean, and standard deviation for each element in this component.

Table 10: Frequencies, Percentages, Mean, and SD in the 1st Round of Ninth Component: *Enhancement*

No	Element	Alternatives						Mean	SD
		Agree		Hesitant		Disagree			
		F	%	F	%	F	%		
1	Assigning them to teach half of the usual teaching load	16	89	2	11	0	0	2.89	0.32
2	Not being assigned any other duties in the school (such as shifting and classroom administrative matters	18	100	0	0	0	0	3.00	0.00
3	Giving them the freedom to choose the classes they wish to teach	18	100	0	0	0	0	3.00	0.00
4	Giving them appropriate financial support	17	94	1	6	0	0	2.94	0.24
5	Providing educational materials, and scientific and educational sources	18	100	0	0	0	0	3.00	0.00
6	Providing other professional growth opportunities inside and outside the school	18	100	0	0	0	0	3.00	0.00
7	Giving education certificate in induction to affiliation with the Teachers Syndicate for those who successfully pass the program	15	83	0	0	3	17	2.67	0.77

It is noticed from Table 10 that all of the elements received the great agreement, and elements 2, 3, 5 and 6 received the agreement of all experts, while the opinions of some experts on the other elements were "hesitant" or "disagree".

9- Monitoring and evaluation: This component included 7 elements and table 11 shows the frequencies, percentages, mean, and standard deviation for each element in this component.

Table 11: Frequencies, percentages, mean and SD in the 1st round of the tenth component: *Evaluation*

No	Element	Alternatives						Mean	SD
		Agree		Hesitant		Disagree			
		F	%	F	%	F	%		
1	Following up the implementation of the training program in all its stages	18	100	0	0	0	0	3.00	0.00
2	Monitoring the teacher professional changes	17	94	1	6	0	0	2.94	0.24
3	Following up on transferring the effect of the training to the classroom	18	100	0	0	0	0	3.00	0.00
4	Ensuring that the evaluation includes all aspects of the training program	17	94	1	6	0	0	2.94	0.24
5	Conducting evaluation studies for the interim and final training program	18	100	0	0	0	0	3.00	0.00
6	Conducting studies about the degree of beginning teachers' satisfaction with these programs and their attitudes towards them	16	89	2	11	0	0	2.89	0.32
7	Studying the effect of training teachers on the achievement of their students	17	94	0	0	1	6	2.89	0.47

It is noticed from Table 11that all of the elements received the great agreement, and elements 1, 3, and 5 received the agreement of all experts, while the opinions of some experts on the other elements were "hesitant" or "disagree".

10- Training times: This component includes 3elements, and table 12 shows the frequencies, percentages, mean, and standard deviation for each element in this component.

Table 12: Frequencies, Percentages, Means, and SD in the 1st Round of the Eleventh Component: *Timing*

No	Element	Alternatives						Mean	SD
		Agree		Hesitant		Disagree			
		F	%	F	%	F	%		
1	The three weeks before the start of the school year	18	100	0	0	0	0	3.00	0.00
2	Days per week for the first and second semesters	18	100	0	0	0	0	3.00	0.00
3	Week on winter vacation	18	100	0	0	0	0	3.00	0.00

It is noticed from Table 12 that all elements of this component have received the agreement from all experts.

At the end of this round, the elements that received the approval of the majority of experts were identified, based on the standard followed in this study, which is that the component received 80% of the experts' opinions (i.e. the approval of 15 experts or more) reached 74elements, and the elements that did not receive agreement reached 10 elements. Table 13 shows the component, frequencies, percentages, means and standard deviations for the elements that did not receive the agreement of the majority of experts in the first round.

Table 13: Components, Frequencies, Percentages, Means, and SD for items that did not receive the agreement of the majority of experts in the 1st round

component	Element	Alternatives						Mean	SD
		Agree		Hesitant		Disagree			
		F	%	F	%	F	%		
Assumptions	Induction training for beginner teachers is a changing process	12	67	3	17	3	17	2.5	0.79
	The induction program lasts for at least one academic year	12	67	3	17	3	17	2.5	0.79
Artistic content	Building a teacher-specific theory of science teaching	11	61	2	11	5	28	2.33	0.91
	Expansion the scientific content of some of the curriculum vocabulary	13	72	4	22	1	6	2.67	0.59
Administrative content	Managing activities accompanying the curriculum, such as laboratories, science clubs, excursions and exhibitions	13	72	3	17	2	11	2.6	0.70
	Communicating with colleagues of science teachers in the school and other schools	14	78	0	0	4	22	2.56	0.86
	Teacher performance self-evaluation	14	78	4	22	0	0	2.78	0.43
Techniques	Social media sites	14	78	3	17	1	6	2.72	0.57
supervising authorities	The colleges of education in the local universities	13	72	3	17	2	11	2.61	0.70
	Teachers Syndicate	14	78	1	6	3	17	2.61	0.78

It is noticed from Table 13 the elements that did not receive the agreement of the majority of experts are distributed among the components of the proposed program for training science teachers in Jordan as follows:

Assumptions: Two elements did not receive the agreement of the majority of experts, namely: “the induction training of beginner teachers is a changing process” and “Expansion the scientific content of some of the curriculum vocabulary,” as two experts were hesitant to agree on the first component, and five experts did not agree on it; while four experts were hesitant to agree on the second component, and one expert did not agree on it.

The technical content: Two elements did not receive the agreement of the majority of experts, namely: "Building a teacher-specific theory about teaching science". They explained that the process of building an educational theory for the teacher needs years of experience and training as a year cannot build a theory for the beginner teacher. The element "extending the scientific content of some vocabulary of the curriculum" as it was reported in each of the two elements by three experts and was not agreed by three other experts, and they explained that the beginner teacher is a new graduate of the College of Science and therefore his knowledge is modern so he does not need training in scientific subjects.

The administrative content: Three elements did not receive the agreement of the majority of experts, namely: "Managing activities accompanying the curriculum, such as laboratories, science clubs, excursions and exhibitions", "Communicating with colleagues of science teachers in the school and other schools", and "Teacher performance self-evaluation". Three experts were hesitant to agree to the first element and two experts did not agree to it. They explained that the content of the element is contained within the classroom management component and the second component did not receive the agreement of four experts. They explained that there are social and administrative barriers that reduce this means; while four experts hesitated to agree on the third element; they explained that self-evaluation comes after stages of educational maturity.

Techniques: The presence of one element that did not receive the agreement of the majority of experts, namely: "Social media sites", as three experts hesitated to agree to it, and one expert did not agree to it. They explained that there are socio-cultural barriers to the use of this method, especially the gender.

The supervising authorities: the presence of two elements that did not receive the agreement of the majority of experts, namely: "colleges of education in local universities" and "Teachers Syndicate". Three experts were hesitant regarding the first element and two experts disagreed on it. They explained that there is a gap between the colleges' theory of

education and the reality of the practice in schools. However, one expert was hesitant about the second element, and three experts disagreed with it. They explained that the Teachers Syndicate is newly formed, and does not have specialised expertise.

The Second Round

In this round, the elements that did not receive the approval of the majority of the experts mentioned in Table 13 were sent to the experts whose opinions were "hesitant" or "disagree". They were asked to do one of the two procedures, the first: reviewing his opinion to conform to the opinions of the majority, and the second: to mention the reasons behind his insistence on his earlier opinion "hesitant" or "disagree." Table 14shows the repetitions of the responses of the experts whose opinions were "hesitant" or "disagree" on the elements that were not agreed on by the majority of experts in the first round:

Table 14: Frequencies of the responses of the experts whose opinions were "hesitant" or "disagree" about the elements that were not agreed on by the majority of them in the first round

Component	Element	Alternatives		
		Agree	Hesitant	Disagree
Assumptions	Induction training for beginning teachers is a changing process	0	1	5
	The induction program lasts for at least one academic year	0	2	4
Technical	Building a teacher-specific theory of science teaching	1	1	5
	Expanding the scientific content of some of the curriculum vocabulary	3	2	0
Administrative	Management of the activities accompanying the curriculum, such as laboratories, science clubs, excursions and exhibitions	4	1	0
	Communicating with colleague science teachers in the school and other schools	2	0	2
	Teacher performance self-evaluation	0	2	2
Techniques	Social media sites	2	2	0
Supervising authorities	The colleges of education in the local universities	3	1	1
	Teachers Syndicate	2	1	1

By merging the opinions of the experts in the second round of the elements mentioned in Table 14 with their views in the first round mentioned in Table 13, the frequencies and percentages in the second round of the elements in which the experts' opinions were "hesitant" or "disagree" and did not receive the agreement of the majority of them in the first round, as in Table 15.

Table 15: Frequencies and percentages in the second round of the elements in which the opinions of the experts were "hesitant" or "disagree" and did not receive the agreement of their majority in the first round

Component	Element	Alternatives					
		Agree		Hesitant		Disagree	
		F	%	F	%	F	%
Assumptions	Induction training for beginning teachers is a changing process	12	67	1	6	5	28
	The induction program lasts for at least one academic year	12	67	2	11	4	22
Technical content	Building a teacher-specific theory of science teaching	12	67	1	6	5	28
	Expanding the scientific content of some of the curriculum vocabulary	16	89	2	11	0	0
Administrative content	Managing activities accompanying the curriculum, such as laboratories, science clubs, excursions and exhibitions	17	94	1	6	0	0
	Communicating with colleagues of science teachers in the school and other schools	16	89	0	0	2	11
	Teacher performance self-evaluation	14	78	2	11	2	11
Techniques	Social media sites	16	89	2	11	0	0
Supervising authorities	The colleges of education in the local universities	16	89	1	6	1	6
	Teachers Syndicate	16	89	1	6	1	6

From Table 15 the following is noticed:

First: Six elements received the agreement from the majority of experts. They are the elements in which the percentages of expert opinions have become “Agreed” beyond the standard adopted in this study. These elements distributed among the components of the proposed program as follows:

- **Technical content:** It includes one element: "The expansion of the scientific content of some of the vocabulary of the curriculum", which was agreed by 16 experts after the opinions of three of them changed from "hesitant" to "agree" while the opinion of two experts remained "hesitant".
- **Administrative content:** It includes two elements, the first: "Managing activities accompanying the curriculum, such as laboratories, science clubs, trips and exhibitions," which received the approval of 17 experts after the opinions of three of them changed from "hesitant" to "agree" and an expert's opinion from "Disagree" to "Agree" while one expert's opinion changed from "Disagree" to "Hesitant". The second component is "communication with colleagues of science teachers in other schools", and it was agreed by 16 experts, after

the opinion of two experts changed from "Hesitant" to "Agree", and two experts insisted on their opinion "Disagree".

- **The techniques** included one element: "social media sites", which was agreed by 16 experts after the opinions of three of them changed from "Hesitant" to "Agree" and one expert's opinion from "Disagree" to "Hesitant".
- **The supervising authorities**: It includes two elements, the first: "Faculties of Education in Local Universities", which was agreed by 16 experts after the opinions of three of them changed from "Hesitant" to "Agree" and the opinion of one expert changed from "Disagree" to "Hesitant"; however, one expert insisted on his opinion, "Disagree'; whereas the second element, the "Teachers Syndicate" was agreed by 16 experts after the opinions of two experts changed from "Disagree" to "Agree" and two experts insisted on their opinions "Disagree" and "Hesitant".

Second: Four elements did not receive the agreement of the majority of experts, which are the elements in which the percentages of the experts' opinions remained "Hesitant" or "Disagree" and did not exceed the standard adopted in this study. These elements were distributed among the components of the proposed program as follows:

- **Program Assumptions:** The two elements included: "The induction training of beginning teachers in a changing process" in which the number of experts from the opinion category "Agree" remained 12 experts; where three experts insisted on their opinion "Disagree"; and an expert insisted on his opinion "Hesitant"; while one expert changed his opinion from "Disagree" to "Hesitant". The experts explained their views that the program's characteristic is a changing process even after the program is consistent. Some of them suggested that the description of the beginner teacher should be "The induction training brings forth a change in the teacher". As for the second element: “The induction program continues for at least one academic year.” The number of experts in the opinion category "Agrees" remainedvat 12 experts. Three experts insisted on their opinion “Disagree” and two experts insisted on their “Hesitant” opinions; while one expert changed his opinion from “Hesitant” to “Disagree”. The experts explained their views that the component's content was included in component eleven “Training times.”
- **Artistic content:** It includes one element: “Building a teacher’s theory about teaching science”. The number of experts' opinions of the category “Agree” became 12 after one expert changed his opinion from “Hesitant” to “Agree”; however, five experts insisted on their opinion, "Disagree". They explained that the process of building an educational theory for the teacher needs years of experience and training for a year cannot build a theory for the beginner teacher.
- **The administrative content**: It includes one element: “Self-evaluation of the performance of the teacher”, where the number of experts from the opinion category “Agree” remained at 12, as two experts insisted in their opinion

"Hesitant", and two experts changed their opinions from "Hesitant" to "Disagree". They explained this as the teacher during this period needs to be assessed by educational experts, such as principals, supervisors and supportive colleagues.

Conclusions

At the end of the second round, the proposed program in its final form includes 80 elements distributed among its eleven components as follows:

1. Program assumptions: it consists of 4 elements; 2. The starting points of the program: consist of 8 elements; 3. Artistic content: consists of 13 elements; 4. The administrative content: consists of 16 elements; 5. Training levels and those responsible for it: consists of 3 elements; 6. Training techniques: consists of 8 elements; 7. The supervising authorities: consist of 6 elements; 8. The means of communication: consists of 5 elements; 9. Promotion: consists of 7 elements; 10. Monitoring and evaluation: consists of 7 elements; and 11. Training times: consists of 3 elements.

It is noticed that this proposed program has included components and elements of induction programs mentioned in the theoretical literature and earlier studies. For example, the proposed program is similar to the ASIST program is assuming insufficient induction programs; supervising authorities; faculties of education; expert teachers; principals; starting points of the program; professional needs of teachers; application of national standards; and the reasons for some teachers leaving the teaching profession. Moreover, this program is similar to other programs and earlier studies in varying degrees, many components, and elements; however, it differs from them in its comprehensiveness and some of its elements because it differed from them by adding elements related to the Jordanian educational system such as starting from identifying the deficiencies revealed by national and international studies in students' achievement in science such as the studies of TIMSS and PISA; the reasons behind some teachers refusing to be hired and some of them quitting the profession in the early years of their employment; learning about educational development projects in Jordan; the role of the teachers syndicate in this program; and familiarity of philosophy and history of science, especially in the Islamic civilisation.

Recommendations

In light of the findings of the study and the proposed program for the professional development of science teachers in light of recent global trends, the following recommendations can be made:

1. Providing induction training programs for science teachers in Jordan once they join teaching. These programs should consider the components and elements of the proposed program that resulted from the study.
2. Adopting the induction training for at least one year, and licensing for the eligible ones to be science teachers.
3. Approving the success of the induction training program as a prerequisite for appointing a science teacher in permanent service.
4. Adopting success in the induction program for beginning teachers as a condition for receiving membership in the Jordanian Teachers Syndicate.
5. Conducting research that deals with the aspects of the process of preparing and evaluating science teachers.

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