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A proposed vision to achieve the requirements of professional development for biology teachers of the secondary stage in light of the Kingdom's Vision 2030

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Abstract

This study aimed at identifying the professional development requirements for biology teachers at the secondary stage in light of the Kingdom's vision 2030 and the degree of availability of these requirements from the viewpoint of biology teachers. The study also aimed at revealing the differences in the responses of biology teachers about the requirements of professional development according to some variables (years of experience, training Program, academic qualification). The study used the descriptive methodology and was applied to a sample of (79) teachers. The study used a questionnaire consisting of (72) items as an instrument, which was distributed on seven domains. The results showed that the degree of availability of professional development requirements for biology teachers at the secondary stage was medium. The results also showed statistically significant differences in the teachers 'responses to the degree of availability of these requirements due to the variables of training Program and years of experience, while there were no statistically significant differences due to the academic qualification variable. A suggested proposal was prepared to achieve the requirements of professional development for biology teachers.

Key words: a proposed Perception- professional development- biology teachers - the secondary stage - the Kingdom's vision. 2030.

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1. Introduction

Education is the most important investment for any country seeking progress and development, especially in an era dominated by continuous change in the various fields of knowledge and the accompanying economic and social changes. Such a trend urges educators and decision-makers to face a great challenge to choose and develop educational policies and systems that adopt to these changes and meet the needs current and future labor market.

The results of the World Economic Forum report "The New Vision of Education and Unleashing Technical Potential" indicated that there is a discrepancy in the indicators of possessing the skills of the twenty-first century between developed and developing countries, which the later do not possess to prepare future generations to enter the market (Trilling and Fadel, 2013).

The Kingdom's vision (2030) included a development plan that focuses on an integrated package of programs to develop the educational environment. The Vision focuses on the performance of teachers and the improvement of the school environment to stimulate development and creativity. It also focuses on developing teaching methods and raising the capacities of teachers. The vision of the Kingdom included several goals, including five Saudi universities to become among the best (200) international universities by the year 2030. Students will be able to achieve advanced results compared to the average international results and obtain an advanced classification in the global indicators of educational achievement. This is done by preparing advanced educational curricula that focus on basic skills and character traits (Vision 2030 website, 2020).

The teacher is one of the most important components if the learning process and impacts students' learning. The teacher directs the educational process towards achieving its goals, and accordingly its success or failure depends on him/her. Education does not progress without the presence of a distinguished and specialized teacher. In addition, and in light of the changing role of the teacher and the types of tasks, the teacher is no longer just a lecturer and a carrier of experiences, but as a director, facilitator and an inspiration for students. The teacher must be aware of new developments in the field of education.

The professional development teachers during the service is one of the basics of improving education because of its great importance in developing the teaching performance and developing students' learning of the skills necessary for them. It is also the primary key to acquire professional and academic skills, whether through direct activities in formal training programs, or by using self-learning methods. Good preparation, continuous training and professional development for teachers are prerequisites for achieving the objectives of the whole learning process.

Therefore, training teachers during service is very important to fulfil these educational roles. Teachers must join training programs based on identifying their training needs, professional and technical, and providing them with the necessary skills and experiences to activate their main role in the educational process (Abdul Salam, 2019).

Several scientific conferences have emphasized the importance of professional development for teachers during service. Some of these conferences are the Tenth Scientific Conference (2011) on the future of Faculties of Education in Egypt and the Arab World and their role in preparing licensing programs for practicing the profession, continuous training programs for teachers during service. The International Scientific Twenty-second Conference for the Egyptian Association for Curricula and Teaching Methods (2012) and the International Conference on the Teacher in Riyadh (2012) entitled: “Identifying the challenges facing the professional development of teachers during service and

proposing appropriate solutions" all ensured the advancement of the scientific, educational and professional level of the teacher. The first international conference at the College of Education, Mansoura University (2013) entitled "Future Teacher: Preparation and Development," was held at the headquarters of King Saud University and aimed at maximizing the benefits from past, current and future initiatives in the field of teacher preparation. The International Educational Conference at King Khalid University entitled “The Teacher and the Age of Knowledge: Opportunities and Challenges” (2016) focused on teachers' preparation and professional development in light of the renewed educational requirements. Recently, the first conference of the Scientific Society "Jisem" at King Khalid University (2019) entitled “the Teacher: Development Requirements and Future Ambition,” also focused on preparing the future teacher in accordance with the Kingdom's 2030 vision, the professional development of the future teacher, and presenting local and international experiences in teacher's preparation and development programs.

The results of previous studies also indicated the effect of professional development on improving teacher's performance. Christopher (2012) sought to develop teachers' skills through training programs to develop their professional competencies in the classroom. Shawer (2013) also aimed at developing teachers' professional capabilities in light of the developed curriculum, as the results indicated that the professional teachers' level helped them to apply the developed curriculum.

Therefore, science teachers, in general, needs professional development and the possession of teaching competencies that enable them to fulfil their roles and responsibilities in light of the Kingdom's vision (2030). This requires a review of teachers' professional preparation and development programs.

1.1. Problem of the Study

Several studies have indicated that there are some deficiencies in the current teachers' preparation and professional development programs and their impact on the teaching performance (Abdul Qadir, 2014; Al-Harbi & Al-Jaber, 2016; Al-Masaid, 2107; Mahdi, 2018; Abalkhail, 2019; Abu Zuhair, 2019; Salameh, 2019). Abdul Salam (2019) pointed to the need to develop programs and take decisions for preparing science teachers in the faculty of education, and to provide training programs and professional development in light of global trends and societal and economic changes. Other studies confirmed that teachers before and during service needs to raise their educational competencies in addition to their ability to use technological tools in teaching (Chai, et al 2010).

In addition, the two researchers' observed through the work of one of them at the university and the other in educational supervision of biology that many high school biology teachers have weaknesses in many of the professional competencies, which prevent them from following up with the changes and developments that occur in their field of specialization.

Given the importance of professional development for science teachers in general and biology teachers in particular, it has become necessary to identify their professional requirements to be active in the future in achieving the Kingdom's vision (2030). Therefore, this study aimed at identifying the requirements of professional development for biology teachers at the secondary level in light of the Kingdom's 2030 vision and a proposed vision for to be achieved.

1.2. Questions of the Study:

This study attempted to answer the following research questions:

1. 1- What are the professional development requirements for biology teachers at the secondary level in light of the Kingdom's 2030 vision?
2. What is the availability of professional development requirements for biology teachers in light of the Kingdom's 2030 vision from their point of view?
3. What is the extent of agreement and difference in the responses of the sample (biology teachers) regarding the requirements of professional development according to the variables (years of experience, training courses, academic qualification)?
4. What is the proposed vision to achieve the requirements of professional development for biology teachers at the secondary level in light of the Kingdom's 2030 vision?

1.3. Significance of the Study:

The importance of this study stems from the expected results. It provides a scientific vision for specialists in the Ministry of Education on the requirements of professional development for biology teachers at the secondary level. Eventually, this will contribute to achieving the strategic objectives of the Kingdom of Saudi Arabia's 2030 vision for national transformation. The Institute of Professional Development at the Ministry of Education and the education departments will benefit from the list of professional development requirements in designing various training packages and educational programs for biology teachers. The Faculties of Education in Saudi universities that are interested in teacher preparation programs will benefit from the listed professional requirements in their academic programs.

1.4. Limitations of the Study:

Thematic limits: the requirements for the professional development of biology teachers in light of the Kingdom's 2030 vision.

Human and spatial limits: the sample of the study included 79 biology teachers in Aseer Education Department.

Time limits: the study was conducted in the first semester of the academic year 2018-2019.

1.5. Definitions of Terms:

Professional Development: Muhammad (2011) defined it as "those ongoing activities and programs that are planned and implemented in order to build and develop the various capacities, skills and experiences of teachers and prepare them for the changing roles in a more efficient and effective manner". Wahba (2011) defined it as "those organized processes and activities that are provided to teachers of all classes and specializations in order to raise the level of knowledge, skills and professional trends they have, achieve continuous professional growth for them, raise their level of professional performance, develop their scientific skills and increase their creativity and innovation capabilities in their work. These processes and activities are carried out by various means such as training programs. It can be defined procedurally as the activities and programs planned to develop the performance of biology teachers at the secondary stage by identifying their professional and training needs and obtaining specific programs to carry out their teaching duties in order to achieve the 2030 vision of the Kingdom.

Requirements of professional development: The researchers define it procedurally as the basic knowledge, skills, values, and attitudes necessary for biology teachers at the secondary level to achieve the Kingdom's vision 2030.

Kingdom's Vision 2030: It is defined as the post-oil plan for the Kingdom of Saudi Arabia, which was announced on 25 April 2016 in order to build the philosophy of the curriculum, policies, objectives, the means for its development, the mechanism for its activation, and linking this to the programs of teachers' preparation and professional development. It also aims at upgrading the teaching methods to make learners the focus of the learning process, building skills, sharpening character, instilling confidence and building creativity (Ministry of Education, 2020)

2. Methods

The current study followed the descriptive approach to identify the reality of the requirements of professional development for biology teachers in the secondary stage in light of the Kingdom's 2030 vision.

2.1. Sampling

The population of the study included all (99) biology teachers in the Education Department in Aseer governorate. The exploratory research sample consisted of (26) teachers (other than the basic research sample). As for the study sample, it included all members of the population of the study. The search tool was distributed to all members of the population of the study, and (79) teachers responded. The following is a description of the sample according to the research variables:

Table 1. Distribution of the sample according to the years of experience variable

Years of experience	No.	Percentage
Less than five years	4	5.06 %
From five years to ten years	21	26.58 %
More than ten years	54	68.35 %
Total	79	100 %

Table 2. Distribution of the sample according to the training courses variable

Training courses	No.	Percentage
Less than five courses	23	29.11 %
From 5-10 courses	26	32.91 %
More than 10 courses	30	37.97 %
Total	79	100 %

Table 3. Distribution of the sample according to the academic qualification variable

academic qualification	No.	Percentage
Bachelor Degree	74	93.67 %
Postgraduate	5	6.33 %
Total	79	100 %

2.2. Instrumentation

First: List of professional development requirements for biology teachers in light of the Kingdom's 2030 vision.

The Kingdom of Saudi Arabia 2030 vision and previous studies related to the professional development of teachers were reviewed. The purpose was to prepare a preliminary list of professional development requirements for biology teachers at the secondary level in light of the Kingdom's 2030 vision. The list was presented to a group of judges in the field of curricula and teaching methods of science and scientific education. In light of their observations, necessary adjustments were made to the list.

Second: Questionnaire for biology teachers at the secondary stage.

The questionnaire aimed at identifying the reality of the professional development requirements for biology teachers in light of the Kingdom's 2030 vision from their point of view. The list of professional development requirements for biology teachers was used in building the questionnaire, and in light of the judges' comments, the necessary modifications were made in terms of drafting and the relevance of each phrase to the dimension it tests (see Appendix 1). The questionnaire included in its final form (72) items, distributed into seven dimensions as follows:

The first dimension: achieving professional development for the biology teacher (13 items).

The second dimension: requirements for biology subject (9 items).

The third dimension: using modern technology in teaching and learning biology (10 items).

The fourth dimension: requirements for dealing with students (14 items).

The fifth dimension: requirements for supporting students' projects and producing them through biology subject (9 items).

The sixth dimension: requirements for evaluating students' performance (8 items).

The seventh dimension: the requirements for serving the local community (9 items).

The three-level scale was used to represent the answers of the participants to the questionnaire (highly available = 3, available = 2, unavailable = 1). To determine the degree of approval of the members of the research sample on each statement and each dimension of the questionnaire, the range of scores was calculated for each statement, where the response range (highest score - lowest score)/number of categories = (1-3)/3 = (67.0). Therefore, if the mean score of the item ranges between (33.2) to (3) then the degree of availability is high, and if the mean score of the item ranges between (67.1) to less than (33.2) then the degree of availability is medium. If the mean score of the item ranges between (1) to less than (67.1), it is not available.

2.2.1. Reliability of the questionnaire

To ensure the reliability of the questionnaire, Cranach's Alpha equation was used, and the following table presents the results.

Table 4. Reliability coefficients for the dimensions of the questionnaire using Cronbach's alpha coefficient

No.	Dimension	Reliability coefficients
1	achieving professional development for the biology teacher	0.76
2	requirements for biology subject	0.78

3	using modern technology in teaching and learning biology	0.71
4	requirements for dealing with students	0.69
5	requirements for supporting students' projects and producing them through biology subject	0.73
6	requirements for evaluating students' performance	0.67
7	the requirements for serving the local community	0.70
Total reliability for the questionnaire		0.81

Table (4) shows that the reliability coefficients for the dimensions and the overall score ranged between (0.67) to (0.78), a value indicating the high stability of the questionnaire and the validity of its use.

2.3. Data Analysis

Descriptive statistics were used, such as percentages, means scores, and standard deviations to describe the research sample and to determine the degree of agreement of the research sample members with the items the questionnaire. Analytical statistics were also used by measuring Pearson's linear correlation coefficient to verify the validity of the internal consistency of the search tool. Cronbach alpha coefficient was also used to verify the reliability of the search tool. The T-Test and One Way ANOVA were used to determine the differences in the responses of the research sample to the requirements of professional development according to the variables (years of experience, training courses, academic qualification).

3. Results and Discussion

3.1. Results of the first question

This question has been answered through the procedures that were followed in preparing the search tool, which resulted in a list of (72) requirements. The list was distributed as follows: the first dimension: achieving professional development for the biology teacher (13 items). The second dimension: requirements for biology subject (9 items). The third dimension: using modern technology in teaching and learning biology (10 items). The fourth dimension: requirements for dealing with students (14 items). The fifth dimension: requirements for supporting students' projects and producing them through biology subject (9 items). The sixth dimension: requirements for evaluating students' performance (8 items). The seventh dimension: the requirements for serving the local community (9 items).

3.2. Results of the second question

To answer the second question, the mean scores and standard deviations of the responses of the research sample were calculated in each dimension of the search tool and for each of its items, and the results are shown as follows:

Table 5. The mean scores, standard deviations, degree of availability and ranking of the dimensions of the search tool

No.	Dimension	Mean score	SD	Degree of availability	Rank

1	achieving professional development for the biology teacher	2.16	0.26	Medium	5
2	requirements for biology subject	2.35	0.23	High	2
3	using modern technology in teaching and learning biology	2.09	0.27	Medium	7
4	requirements for dealing with students	2.42	0.17	High	1
5	requirements for supporting students' projects and producing them through biology subject	2.26	0.25	Medium	3
6	requirements for evaluating students' performance	2.17	0.31	Medium	4
7	the requirements for serving the local community	2.15	0.25	Medium	6
The mean score for the search tool		2.23	0.14	Medium	

Table (5) shows that the mean score of the search tool was (2.23) with a standard deviation of (0.14) and with a moderate degree of availability. The mean scores for the dimensions of these requirements ranged between (2.09 - 2.42) with a degree of availability ranging from medium to high. Only two dimensions had a high degree of availability, which were the requirements for biology subject and the requirements for dealing with students. The remaining five dimensions had a medium degree of availability.

These results indicate that the degree of availability of professional development requirements for biology teachers at the secondary stage in light of the Kingdom's Vision 2030 from their point of view ranged from medium to high. Such results can be interpreted in light of the need to develop methods used in achieving professional development for teachers so that they are consistent with the Kingdom's vision 2030. Such new methods should take into account the varied roles of the teacher. In addition, there is still an urgent need to make more efforts to make such methods consistent with modern trends in preparing the science teacher in general and the biology teacher in particular and professional development.

These results are consistent with previous studies (Abd al-Salam, 2014; Ghanem, 2016; Al-Ahmad and Al-Sulayyum, 2017; Al-Masaid, 2017; Abalkhail, 2019; Abazhair, 2019; Zhou, 2011). These studies recommended the importance of professional development for teachers, qualifying them in accordance with their needs, facing future challenges, and improving the quality of learning, by diversifying the methods of professional development for teachers.

3.3. Results of the third question.

To answer this question, the One Way ANOVA test was used to detect differences in the responses of the sample according to the variables of years of experience and training courses. The T-Test was also used to detect differences according to academic qualification variable. The results are shown in the following table.

Table 6. The results of One Way ANOVA of the responses of the sample according to the years of experience variable

Dependent variable	Source of variance	Sum of squares	Freedom value	Mean squares	F value	Sig.

The overall score for the search tool	Between groups	0.32	2	0.16	9.62	Sig. at 0.01
	Within groups	1.25	76	0.02		
	Total variance	1.57	78			

Table (6) shows the presence of differences in the responses of the sample due to the years of experience variable. To identify the Post Hoc of these differences, Scheffe method was used as presented in the following table.

Table 7. Post Hoc of each two groups of the study sample according to the years of experience using Scheffe method

Comparison between the groups according to the years of experience variable	Mean score	Standard error	Sig.	The direction of differences
Less than five years From five to ten years	0.07	0.07	0.53 (Not sig.)	no differences
Less than five years More than ten years	0.20	0.07	0.01 (sig.)	In favor of the group of more than ten years
From five to ten years More than ten years	0.12	0.03	0.01 (sig.)	In favor of the group of more than ten years

Table (7) shows that the differences in the total degree of professional development dimensions were higher for participants whose experience is more than ten years of experience. Experience seems to play an important factor in the availability of professional development requirements foe biology teachers. Table (8) shows the results related to the second variable of the study, number of training courses.

Table 8. The results of One Way ANOVA of the responses of the sample according to the training courses variable

Dependent variable	Source of variance	Sum of squares	Freedom value	Mean squares	F value	Sig.
The overall score for the search tool	Between groups	0.72	2	0.36	32.51	Sig. at 0.01
	Within groups	0.85	76	0.01		
	Total variance	1.57	78			

Table (8) shows the presence of differences in the responses of the sample due to the training courses variable. To identify the Post Hoc of these differences, Scheffe method was used as presented in the following table.

Table 9. Post Hoc of each two groups of the study sample according to the training courses using Scheffe method

Comparison between the groups according to the training courses variable	Mean score	Standard error	Sig.	The direction of differences
Less than five courses From 5-10 courses	0.06	0.03	0.16 (Not sig.)	no differences
Less than five courses More than 10 courses	0.22	0.03	0.01 (sig.)	in favor of the group with more than 10 courses
From 5-10 courses More than 10 courses	0.16	0.03	0.01 (sig.)	in favor of the group with more than 10 courses

It is evident from Table (9) that the group with more than ten training courses scored better than the other groups. This indicates that the more the teacher receive training courses the more the professional development requirements are available. The T-Test was conducted to find differences between the study sample according to the academic qualification variable as shown in Table (10).

Table 10. The T-Test results to detect differences according to the academic qualification variable

Dependent variable	Academic qualification	No.	Mean score	SD	Freedom value	T value	Sig.
The overall score for the search tool	Bachelor	74	2.22	0.14	77	1.48	0.14 Not sig.
	Postgraduate	5	2.32	0.13			

It is clear from Table (10) the absence of differences in the responses of the sample due to the academic qualification variable.

These findings revealed that the greater the number of years of experience the teacher has and the greater the number of training courses he obtains, the more able he is to have professional development requirements. Biology teachers of different scientific qualifications realize the importance of requirements for professional development in order to carry out their teaching roles, as well as their awareness of the teacher's need for professional development on an ongoing basis, regardless of the academic qualification obtained by the teacher. These results are consistent with the results of Al Ahmad and Al-Sulayhum (2017), which indicated the importance of identifying the professional growth needs of science teachers regardless of their academic qualifications.

3.4. Answer of the fourth question

In light of the discussion and interpretation of the results of this study, the proposed vision was developed to achieve the requirements of professional development for biology teachers at the secondary stage in light of the Kingdom's 2030 vision.

The philosophy of this vision stems from the Kingdom's 2030 vision and the true message of the teacher. Its foundations lie in improving the attraction of teachers, preparing them, qualifying and developing them, consolidating positive values and building an independent personality for the people

of the nation, and providing learners with the knowledge and skills necessary to match the needs of the future labor market.

Principles of the vision:

The basic principles of the proposed vision come from the fact that the successive and continuous changes in the social environment are reflected directly and indirectly on the teaching profession, which imposes the need to create a change in the professional and functional roles of science teachers in general and biology teachers in particular. Eventually, this will make the knowledge and information that teachers acquires during the preparation stage in the teacher preparation institutions insufficient to enable them to face these continuous changes. The continuity of professional development programs aimed at biology teachers is a necessity to keep pace with scientific and technical progress and in response to the Kingdom's vision 2030. The vision's focus is the teacher's interest and development because any reform or development of education comes from the impact that the teacher leaves in the knowledge, behaviors, skills, values, and attitudes of students. Creating an effective professional development that is consistent with the requirements of the Kingdom's vision 2030 is a sustainable and future professional development, because it is related to the professional path of the institution and the career path of the teacher. It also requires a kind of leadership that can deal with future changes.

Objectives of the proposed vision:

The current vision aims mainly to achieve the requirements of professional development for biology teachers at the secondary stage in light of the Kingdom's vision 2030. This is measured according to the dimensions of professional development and its requirements, especially the seven dimensions under study, and this is done through the following:

- Providing biology teachers with modern basic scientific knowledge in the field.
- Providing in-service training programs for secondary biology teachers on how to use modern educational technology developments in teaching and learning.
- Providing professional development programs for biology teachers at the secondary stage to improve the quality of learning that meets the requirements of development and the 2030 vision. These programs should be related to the following educational aspects: modern teaching strategies, how to conduct experiments using virtual laboratories, using modern evaluation methods, developing different kinds of thinking skills among students, connecting students with applications through studying of biology topics.
- Encouraging biology teachers at the secondary stage to use modern methods to develop their professional performance in light of contemporary changes.

Mechanisms of the proposed vision:

- Developing a system and policy for the professional development of biology teachers at the secondary stage through good planning by the Ministry of Education to improve the performance of biology teachers, and to organize, implement and supervise implemented programs.
- Seeking permanent improvement of teaching processes through activities and programs that adopt the application of modern concepts, and to be consistent with international standards, to ensure the quality of general education outcomes.
- Paying attention to remote training, and creating partnership with colleges of education in this regard. The participation of colleges of education in the professional development programs

of science teachers in general and biology teachers in particular has become necessary to provide knowledge and skills, and to discuss the problems that arise in the field.

- Providing the material and human requirements so that those in charge of professional development can continue their efforts in implementing and developing professional development programs using modern educational technologies.
- Providing material and moral incentives for science teachers in general to encourage them to join professional development programs, improve their teaching performance, and achieve the Kingdom's 2030 vision.

Requirements for implementing the proposed vision:

- Developing a database about biology teachers at the secondary stage (graduation years, graduate schools, academic qualifications, training courses, workplaces) and professional development local and international centres for biology teachers.
- Requiring biology teachers to enrol in educational and specialized professional development programs to pass professional license tests, and to provide them with modern knowledge continuously.
- Providing material and moral incentives to encourage biology teachers to attend specialized scientific seminars and conferences, conduct research and motivate them to complete postgraduate studies.
- Removing all the obligations that are not part of the biology teacher's work and that affect his performance to invest his energy with his students.
- Encouraging remote training and professional development programs and the use of educational platforms, video conferencing and Zoom programs for science teachers.
- Developing school libraries and enriching them with modern scientific periodicals in various disciplines in general and in the field of biology in particular, linking them to the Arab, local and international information networks, and preparing a guidebook displaying their contents.
- Equipping all science laboratories in schools with virtual laboratories and computers.
- Strengthening the partnership between the Faculties of Education and the education departments in each region and governorate in a way that contributes to diversifying the experiences and programs provided to biology teachers, and developing professional development programs.
- Equipping classrooms in all schools with smart classroom capabilities (internet networks - smart boards, educational platforms, data show, virtual laboratories, printers, and wireless networks).

4. Recommendations:

In light of the results of the current study, the two researchers recommend the necessity of diversity in the methods and means used to achieve professional development for biology teachers at the secondary stage. Professional development plans for secondary school biology teachers should be prepared in light of their actual training needs. The programs for preparing science teachers in the Faculties of Education should be continuously upgraded to conform to the requirements of achieving the Kingdom's 2030 vision. The study also recommends paying attention to self-learning and e-learning programs while preparing professional development plans for biology teachers, in addition to enabling biology teachers to obtain the minimum training appropriate to their needs.

The study suggests conducting research similar to the requirements of professional development for teachers of other courses such as physics and chemistry. It is also suggested to conduct a study in the

effectiveness of a training program based on the requirements of professional development for biology teachers at the secondary stage in developing their teaching competencies. Another research area could be the obstacles to implementing and developing professional development programs for high school biology teachers.

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Appendix 1:

Questionnaire

A Proposed Vision to Achieve the Requirements of Professional Development for Biology Teachers of the Secondary Stage in Light of the Kingdom's Vision 2030

Dear biology teacher,

Greetings,

The two researchers are conducting a study entitled: "A Proposed Vision to Achieve the Requirements of Professional Development for Biology Teachers of the Secondary Stage in Light of the Kingdom's Vision 2030." In order to achieve the objectives of the study, a questionnaire was prepared to collect data. It includes seven dimensions; methods for achieving teacher professional development, requirements for biology, requirements for employing modern technology in teaching and learning, requirements for dealing with students, requirements for supporting students' projects and their production through biology, requirements for student performance evaluation, and requirements for community service.

We are pleased with your participation with us by answering this questionnaire. After reading each item carefully, you are required to determine the degree of your agreement with it by choosing one of the alternatives (highly available - available - unavailable). These data are confidential and used for scientific research only. There is no right or wrong answer, all your answers are correct as long as they express your opinion honestly and freely, and there is no specific time for the answer.

Thank you for your continued cooperation.

The two researchers

First: general information

1. Name (optional)
2. Years of experience in teaching:

☐ Less than 5 years

☐ From 5 to less than 10 years

☐ More than 10 years

3. Number of training courses in professional development in biology:

☐ No courses

☐ From 5 to less than 10 courses

☐ More than 10 courses

4. Academic qualification:

☐ Bachelor degree

☐ postgraduate degree

NO.	Items	highly available	Available	Unavailable
The first dimension: What is the degree of availability of the requirements for achieving the professional development of biology teachers?				
1	Short training programs in the field of teaching biology course			
2	Distance training to follow the new teaching biology course			
3	Scientific and practical explanatory video presentations in biology			
4	Peer training in some teaching skills in biology			
5	Educational supervision sessions with the biology supervisor			
6	Exchange of classroom visits between biology teachers in the same school			
7	Biology teachers' visits to their colleagues in other schools.			
8	Forums and specialized websites.			
9	Educational and scientific conferences, seminars and workshops			
10	Personal knowledge and reading.			
11	Network with experts in the field of biology.			
12	Conducting operational field research.			
13	Enrolling in postgraduate programs.			
The second dimension: What is the degree of fulfillment of the requirements for biology course?				
14	Continuing to raise the teaching efficiency of the teacher in biology annually.			
15	Employing the general goals of biology.			
16	Following up on everything new in the field of biology.			
17	Following up with websites related to biology.			
18	Mastery of research skills in the field of biology.			
19	Linking the scientific material to the environment surrounding students.			
20	Developing students' positive attitudes towards biology.			
21	The teacher's mastery of teaching strategies of his specialization.			
22	Designing interactive educational activities in biology.			
The third dimension: What is the degree of fulfillment of the requirements for employing modern technology in teaching and learning in biology?				
23	Mastering the basic skills of computer applications.			
24	Employing modern technical means in communicating information to students.			
25	Employing the appropriate technical means in communicating with students.			
26	Having the skills of building and designing electronic evaluation tools.			
27	The ability to use and employ e-courses.			
28	Employing websites related to biology.			
29	Instructing students to make use of information technology in preparing assignments.			
30	The ability to shift from regular education and e-learning.			

31	Employing modern technical means to facilitate teaching and learning processes.			
32	Designing and production of software and multimedia.			
The fourth dimension: What is the degree of availability of the requirements for dealing with students?				
33	Activating the methods of stimulating students' motivation to learn.			
34	Employing students' growth characteristics in preparing lessons.			
35	Taking into consideration individual differences among students.			
36	Activating students' behavior modification methods.			
37	Encouraging students to use self-learning methods.			
38	Development of appropriate educational and social values among students.			
39	Spreading the culture of tolerance and dialogue among students.			
40	Educating students about the most important global challenges and ways to deal with them.			
41	Revealing the abilities and talents of students.			
42	Employing students' abilities and talents.			
43	Developing students' various kinds of thinking skills.			
44	Satisfying the educational, psychological and social needs of students.			
45	Enhancing students' self-discipline.			
46	Developing an appreciation of the efforts of scientists in the field of biology.			
The fifth dimension: What is the degree of availability of requirements for supporting students' projects and producing them through biology subject?				
47	Giving students the opportunity to face the problems they have on their own.			
48	Helping students gain educational experiences through implementing projects.			
49	Encouraging students to collaborate through participatory project implementation.			
50	Employing students' acquired knowledge, skills and experiences in real educational situations.			
51	Providing an interactive learning environment that facilitates student participation in project implementation.			
52	Presenting real educational assignments related to students' lives and reality.			
53	Giving the opportunity for students to choose projects and tasks according to their preferences and interests.			
54	Following up on students' performance during the implementation of projects and overcome the difficulties they may face.			
55	Using projects in developing students' higher thinking skills.			
The sixth dimension: What is the degree to which the requirements for evaluating students' performance are met?				
56	Employing multiple methods to evaluate students' performance.			
57	Taking into account the terms of formulating the different types of questions.			
58	Following up on the assignments of students periodically.			

59	Linking teaching methods and evaluation.			
60	Designing some tests electronically.			
61	Analyzing the results of some tests electronically.			
62	Employing the results of student performance evaluation to improve the educational process.			
63	Encouraging students to practice self-evaluation of their learning.			
The seventh axis: What is the degree of fulfilment of the requirements for serving the local community?				
64	Communicate with community organizations related to biology.			
65	Clarifying school policies to members of the local community.			
66	Participating in various activities of the local community.			
67	Participation in solving community problems.			
68	Participation in local community events and activities.			
69	Spreading knowledge among the members of the local community.			
70	Cooperating with local councils and entities.			
71	Supporting students' communication with community institutions.			
72	Discussing students' problems with parents and educating them on how to deal with them.			