

The Impact of Secondary School Teachers' Training Program on the Professional Development of In-Service Biology Teachers

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Abstract: Teachers' professional development is essential to achieve quality teaching, through gaining different classroom management techniques, different teaching strategies to cater for different students' levels and needs, and an in-depth updated subject knowledge. In order to be a permanent teacher at the Lebanese secondary public schools, teachers must follow a specific training program at the Lebanese University, Faculty of Education. The aim of this research is to investigate the impact of the training program, given at the Lebanese university for in-service secondary biology teachers, on their professional development. The study employed descriptive quantitative methodology to answer the research question. A sample of 50 biology secondary teachers filled a questionnaire related to their perceptions about professional development at the beginning of the training and filled the same questionnaire after completing four courses: teaching biology I and II, practicum I and II. The data was analyzed using SPSS (Statistical Package for the Social Sciences). The results showed a significant relation between attending the training program and the teachers' professional development, specifically in the axis related to their perceptions of themselves as science teachers. Based on this study continuous professional training for in-service teachers is highly recommended.

Keywords: Training program, Professional development, Secondary biology teachers' perceptions

Introduction

Teachers are the most significant contributors to raising educational standards. They are the key implementers of new programs and practice that impact on students' learning. Teachers' qualities, experience, certification and education have great influence on students' achievements (Bird, 2017). Teachers are considered the most influential factor in educational reform intended to promote students' learning (Dufee & Aikenhead, 1992). Thus, in order to improve the efficiency and quality of teaching, teachers should be highly skilled and largely professional in a resourceful and motivated way.

Teacher Training and Professional Development

Nowadays, the task of a teacher is evidently more than just planning and executing a lesson plan. Teachers are expected to tune into how students think and challenge them to learn, besides being role models encouraging them to integrate human values. In this context a study has shown that teacher' effects are dominant factors affecting student academic performance (Sanders, Wright & Horn, 1997). Teaching is a continuous evolving career that requires regular follow up, reevaluations, reflections and eventually continuous development. Consequently, teachers' training is of great significance because teachers' qualities determine the quality of education delivery and hence students' outcomes. The main objective of pre-service teachers' training programs is to develop competent, professional teachers who effectively contribute to student learning (Tardif, 2001).

Moreover, in-service training program is the process of continuously updating teacher's knowledge, skills and interests in chosen field (Nakpodia, 2008). The benefits of in-service training of teachers is to guide them to

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obtain academic and professional qualifications in order to improve their positions in the school system, and to help them acquire more conceptual and technical knowledge, skills and competencies in their teaching subjects and in pedagogy in order to improve their efficiency in the classroom. Thus, teachers' training enables them to be adequately equipped to meet up with the challenges of the 21st century (Asiyai, 2016).

In-service training is a professional development (PD) methodology that involves personal and classroom-based coaching within a structured program, intended to provide teachers with new skills and technical feedback about better teaching practices (Harvey, 1999).

Moreover, professional development program in education is a wide range of specialized training or professional learning purposefully designed to help teachers improve their professional knowledge (Hidden curriculum, 2014). Professional development program is supposed to be a continuous, focused, daily learning for teachers individually and collectively (Sodan, 2017). Thus, professional development training programs enhance teachers' knowledge, skills, and motivation. Teacher training is one form of continuous professional development. Perrenoud (2001) developed ten core competencies for professional development, according to him the trainee teacher should:

1. Organize and facilitate learning situations.
2. Manage the progress of learning.
3. Design and develop differentiating features.
4. Involve students in their learning and their work.
5. Work in team.
6. Participate in the school management.
7. Inform and involve parents.
8. Use of new technologies.
9. Face the duties and ethical dilemmas of the profession.
10. Manage his own training.

Similarly, Danielson (2013) has developed a framework for evaluating teachers' PD, where he identified the following domains: Planning and Preparation; Classroom Environment; Instruction; Professional Responsibilities: Reflecting on teaching; maintaining accurate record; participating in the professional community; growing and developing professionally. The idea that PD can foster improvements in teaching is widely accepted, however, professional development for in-service teachers is fragmented, consisting primarily of short workshops that are neither connected to each other nor to the teacher's classroom work.

Professional Development of Science Teachers

Becoming a professional science teacher is a continuous process that stretches from pre-service experiences in undergraduate years till the end of a professional career. Science has a rapidly changing knowledge base and societal issues, and teachers will need ongoing opportunities to build their understanding and abilities. Science teachers require the opportunity to study and engage in research on science teaching and learning, and to share with colleagues what they have learned (NRC, 1996). Science education reforms called on teachers to adopt inquiry as a major strategy of their teaching. The U.S. reform documents of the American association for the advancement of science (AAAS, 1993) stated that inquiry teaching strategy should be considered as a major strategy for teaching science, which teachers must know how to conduct in the classrooms (AAAS, 1993; NRC, 1996). However, inquiry-based teaching is a complex and sophisticated way of teaching that requires the teacher to have an adequate understanding of the method (Crawford, 2007).

Teachers of science build skills gradually, starting in their undergraduate years, where they engage in science and gain some experience in teaching. They then experience the realities during their first years in the classroom, from work with other teachers, take advantage of professional development offerings, and learn from their own efforts and those of their colleagues.

The National Science Educational Standards identified four standards for professional development of science teachers: Professional development for teachers of science requires learning essential science content through the perspectives and methods of inquiry; Professional development for teachers of science requires integrating knowledge of science, learning, pedagogy, and students; it also requires applying that knowledge to science teaching; Professional development for teachers of science requires building understanding and ability for lifelong learning; Professional development programs for teachers of science must be coherent and integrated (NRC, 1996).

To be a qualified, competent, and effective science teacher, one should understand the nature of science, implement new cooperative, collaborative and inquiry-based teaching methods, understand the teacher's role, learn and practice planning and organization, build personal relations, and be enthusiastic when teaching science (TroWbridge & Bybee, 1990).

Training and professional development of Lebanese Secondary Teachers

The Lebanese government is involved in science teacher preparation and training through the Lebanese University, the Center for Educational Research and Development (CERD), and the Ministry of Education and Higher Education. Lebanese public school teachers are trained in two institutions: The Faculty of education of the Lebanese University and CERD. Since the academic year 2009-2010 the Faculty of education implemented the LMD program (License – Master – Doctorate) offering a Bachelor degree in Education and Teaching Diplomas in different specialized majors, as well as Professional and Research Master Degrees. In addition, it offers the Certificat d'Aptitude Pédagogique à l'Enseignement Secondaire (CAPES) (Certificate of Qualification in Education for Secondary School Teaching) that is required for employment in public secondary schools. To be admitted to the CAPES program, students are required to hold a 3 or 4-year degree in a subject area taught at the secondary school level such as biology, chemistry, or physics and to pass an entrance examination administered by the Council of Civil Service, a department of the Lebanese Government in charge of employment in the civil service. However, private school teachers need not be graduates of teacher preparation programs consequently, many private schools employ beginner teachers of biology, chemistry, or physics to teach science at all levels, resulting in an over-emphasis on disseminating information (because teachers tend to teach the same way they were taught).

According to BouJaoude (2000) the general goals of the education programs offered at the Faculty of Education include providing prospective teachers with theoretical and practical information needed for good teaching and helping them to develop skills necessary to live and work with others. Analysis of the course descriptions, the syllabi, and the interviews conducted with faculty members shows that almost all methods instructors emphasize the nature of science, constructivist ideas, the Lebanese Science Curriculum, and a variety of teaching and laboratory approaches to science teaching.

In addition, in Lebanon, science teacher education programs are offered by many private universities and colleges such as American University of Beirut (AUB), Haigazian University, Lebanese American University (LAU), Notre Dame University, University of Saint Joseph (USJ) and many others. In all universities prospective teachers are required to have an undergraduate degree in a science major or a number of science courses depending upon the classes they intend to teach. Furthermore, they have to complete general pedagogy courses, science methods courses, and perform field work.

Wehbe (1984) found that teacher preparation at Lebanese colleges, universities, and specialized institutes emphasizes technical and theoretical issues and neglects moral and ethical components of the teaching-learning process. Murr (1983), on the other hand, found that the major difference between the elementary and intermediate teacher education programs implemented by CERD is that elementary teachers are prepared as classroom teachers while those at the intermediate level are prepared as specialized subject matter teachers (secondary programs were not examined).

Haddad (1983) described the goals and structures of the teaching diplomas in elementary and secondary (including intermediate) education offered at the American University of Beirut. According to Haddad, teachers working toward a Teaching Diploma in elementary or secondary education followed a program consisting of four components: pre-requisite subject matter courses, general pedagogy courses, methods courses, and field work.

On the other hand, the Training and Development Office of CERD was in charge of establishing the continuous training project (CTP) to train public school teachers on new curricula implemented in 1997. According to Zeitoun (2014) the teachers and trainers who participated in the new continuous professional development program in Lebanon (CTP) show growth in professionalism. Nowadays, CERD offers yearly training workshops for in-service teachers at all levels except university education. Teachers are trained during the academic year and within their working hours for 5 to 7 days of training per academic year, teachers can register for the courses by choosing from the regional training plans that are issued to institutions, schools and high schools annually. The training courses are conducted in the training centers distributed in different regions in Lebanon (CERD, 1995).

To be a tenured secondary teacher in public schools, in-service teachers should pass the civic service exam and then should attend and pass a training program at the Faculty of Education of the Lebanese University. Further to completing the program and passing all courses they earn a CAPES degree. In 2017, more than 2,000 in-service secondary teachers from all over Lebanon were admitted to the Faculty of Education to pursue a training program in order to be tenured as public school teachers. A special training program was prepared for in-service biology secondary teachers based on science education research which focused on the integration of knowledge, skills and attitudes to develop a better understanding of scientific concepts (Zeidan & Jayosi, 2015) in order to be able to deliver high-quality teaching. As instructors at the Faculty of Education, we taught the following core courses: Teaching Life Sciences I and II and Practicum I and II for in-service biology secondary teachers. The main objectives of these courses are allowing Lebanese biology secondary teachers to be familiar with the Lebanese curriculum, to understand the nature of science and the basic concepts of Science Education and Didactics of Biology. These courses allow teachers to acquire new teaching and assessment methods and to keep them up to date with new trends in teaching biology. In addition to acquiring the components of the teaching learning process, preparing lesson plans based on new teaching methodologies and techniques, practice teaching in cooperative schools and self-reflection to increase their teaching skills.

Purpose of the study

The aim of this research is to investigate the impact of the training program implemented at the Lebanese University for in-service contractual secondary biology teachers on their professional development. The study will answer the following research question:

What is the impact of in-service teacher training program for biology secondary teachers on their professional development?

Method

This study is descriptive analytic implementing the quantitative method. It aims to show the effect of the training program on in-service teachers' professional development. For this purpose the same questionnaire was administered to in-service contractual secondary biology teachers before and after completing the training program at the Lebanese University, Faculty of Education to earn their CAPES degree in order to be tenured teachers in secondary public schools. Descriptive and inferential analysis using SPSS program was implemented to analyze the data collected.

Participants

A convenient sample of 50 in-service teachers filled completely the pre and post questionnaire. All participants completed the core courses in the training program related to teaching biology, namely Teaching Life Sciences I and II, in addition to the practicum courses. The main objective of these courses is to enhance their knowledge of science, their teaching skills and attitude. The majority of the teachers were females coming from different regions of Lebanon, and their teaching experience ranged from 1 to 20 years.

Instrument

Data was collected using a questionnaire that was adopted from (Trowbridge & Bybee, 1990). This self-evaluation questionnaire for teachers is composed of 25 items describing the various facets of science teaching. It provides insights concerning some characteristics of science teachers. It is divided into 5 categories: Knowledge of science, planning and organization, teaching methods, personal relations and enthusiasm, and each category is composed of 5 items. The questionnaire uses Likert scale to indicate how each item currently characterizes them as science teachers, it ranges from 1 to 5 points as follows:

- 5- Very characteristic of me. This is a real strength of my teaching.
- 4- Frequently characteristic of me. This is a good aspect of my science teaching.
- 3- Sometimes characteristic of me. I should evaluate this aspect of my science teaching.
- 2- Seldom characteristic of me. I should improve this aspect of my science teaching.
- 1- Never characteristic of me. I really need to improve this aspect of my science teaching.

The questionnaire was administered to the participants at the beginning of the training program, and at the end of the program that lasted 28 weeks to answer the research question: “What is the impact of in-service teacher training program for biology secondary teachers on their professional development?”

Results

To answer our research question data collected from the pre and post questionnaire was analyzed using SPSS. The means of the pre and post questionnaire were computed and compared, table 1 shows the results of the paired T- test.

Table 1. Paired T- test results of the pre and post questionnaire means

		Mean	Std. Deviation	Std. Error Mean	Sig.(2-tailed)
Pair 1	PreMean	3.7112	.25224	.03567	
	PostMean	4.6656	.33668	.04761	.000

The results show high significance, by which sig (2-tailed) is 0.000 which is less than 0.05 (p value). The mean has increased from 3.7112 (pre-mean) to 4.6656 (post-mean). The standard deviation in pre-mean (.25224) is less than that in the post-mean (.33668).

Then, the pre and post means of the five studied categories of the questionnaire (Knowledge of science, planning, teaching methods, personal relations and enthusiasm) were computed and compared, figure 1 shows the compared means.

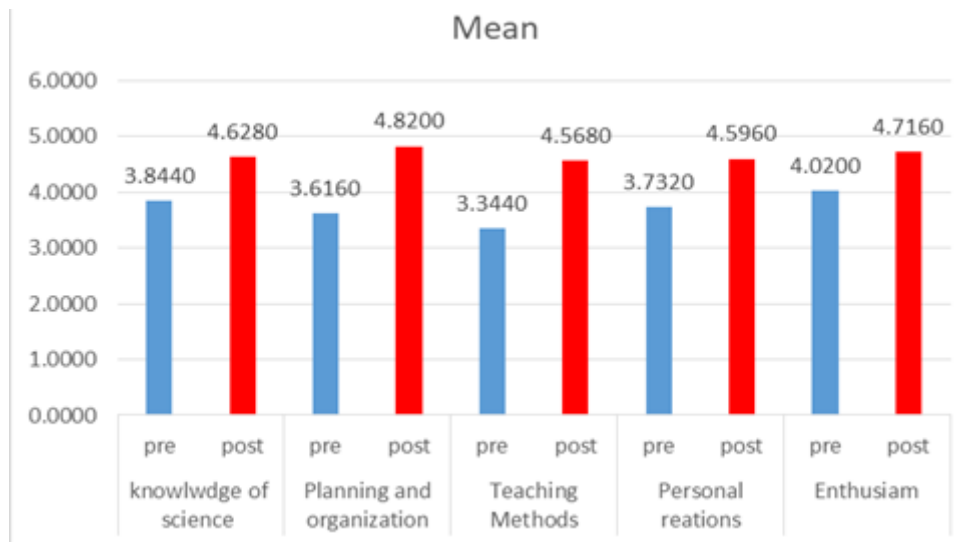


Figure 1. Comparison between the pre and post means of the five categories of the questionnaire

The comparison shows an increase in the post means of the five categories according to the following order: teaching method > planning and organization > personal relations > knowledge of science > enthusiasm. Moreover, the one tailed T test was performed, the results are shown in (Table 2).

Table 2. Paired T test results of the pre and post questionnaire categories

		Mean	Std. Deviation	Std. Error Mean	Sig.(2-tailed)
Pair 1	pre knowledge of science	3.8440	.39649	.05607	
	Post knowledge of science	4.6280	.28574	.04041	.000
Pair 2	Pre planning	3.6160	.36554	.05169	
	Post planning	4.8200	1.41551	.20018	.000
Pair 3	Pre teaching methods	3.3440	.41608	.05884	
	Post Teaching methods	4.5680	.31131	.04403	.000
Pair 4	Pre relations	3.7320	.39094	.05529	
	Post relations	4.5960	.26951	.03811	.000
Pair 5	Pre enthusiasm	4.0200	.38386	.05429	
	Post enthusiasm	4.7160	.27132	.03837	.000

The results show high significance in all categories, by which sig (2-tailed) is 0.000 which is less than 0.05 (p value).

Discussion and Conclusion

The purpose of this research was to investigate the impact of the training program provided at the Lebanese university, faculty of Education, for in-service secondary biology teachers on their professional development. A questionnaire divided into five categories related to professional development was implemented before and after the training program. The results show that this program enhanced the in-service teachers' knowledge of science, planning and organization, teaching methodologies, personal relations and enthusiasm. This finding can be justified by the fact that the core courses of the training program (Teaching Life Sciences I & II, Practicum I & II) implemented new cooperative, collaborative and inquiry-based teaching methodologies integrating technology in order to develop participants' higher order thinking skills such as critical thinking and problem solving skills. These methods allowed in-service teachers to learn that teaching science should be consistent with the nature of scientific inquiry and that instruction should begin with questioning about nature, and continue by actively engaging the students, concentrating on the collection and use of evidence, and using the team approach. Thus, inquiry experiences should be emphasized for teachers to understand the natures of science (NOS) (Chiappetta, 2010). The results are consistent with the literature which emphasized that teachers' professional development should be an ongoing process which includes activities and practices that lead to enhancing the teachers' knowledge, skills and attitudes (NEPC, 2002). According to Abd-El-Khalick (2012) science teachers who understand and integrate NOS are able to utilize effective teaching approaches. The findings are in parallel with the study of Dani (2009) which focused on the necessity of teachers' professional development as a condition for the development of "science as a way of knowing". In addition, the implemented methods enhanced the communication skills and active listening of in-service teachers and allowed them to develop effective personal relations and increased their enthusiasm. Moreover, during the training program the in-service teachers practiced planning and organization by preparing, implementing and reflecting on adequate lesson plan. The effective professional development training programs can assist teachers in building effective inquiry strategy skills to be used in the classroom (Sodan, 2017). Thus the training program implemented in this study enhanced the in-service secondary biology teachers' professional development.

Recommendations

Based on the results of the study in-service teachers' continuous training is highly recommended in order to enhance their skills and keep them updated in relation to scientific knowledge and newly implemented teaching methods. Similarly, the results of the research of Ayoubi, El Takach, & Rawas (2017) recommend that in-service teachers should be involved in continuous training and professional development programs to keep them informed and up-to-date in both content and pedagogy. Moreover, it is recommended that training programs for in-service science teachers should implement inquiry based teaching methods facilitating cooperation and collaboration among teachers in order to plan, organize and implement adequate and effective lesson plans.

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