

# Chapter 16

## Teaching Practices and Mathematics Teacher Education in Lebanon



Hiba Naccache

**Abstract** This chapter describes mathematics teacher education in Lebanon that has well-developed systems for teacher preparation. It investigates Teacher Education Strategies and practices in Lebanon with a focus on private and public sectors, within the context of philosophy, policies for enrollment, training, ongoing professional development, and collective improvement of practice. Moreover, this chapter describes the structure of the Lebanese teacher development program around the following components: government policies, standards for entrance the teacher education program, characteristics of the education program for mathematics teachers in secondary education, alternative teacher's certification programs in the private sectors, and recruitment according to professional development. The chapter investigates some reports describing teachers' qualifications and their confidence in teaching mathematics. The final part attempts to provide some conclusions about the effectiveness of such programs in developing mathematics teachers and induce them into classrooms.

**Keywords** Lebanon · Teaching strategies · Professional development · Training programs · Quality of teaching

### Introduction

Several research studied the impact of teacher's pedagogical content knowledge (PCK) on student's learning outcomes in mathematics; they explored and investigated (PCK) to understand the constitution of teachers thinking. Studies are working on filling the research gap on teacher's training and its impact on their practices particularly in mathematics, where teachers' qualification has huge effect on students understanding of the content.

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Many questions arise about teachers' preparation programs in mathematics in Lebanon and the best way to success in improving educational outcomes. Some of the questions to answer are:

- What are the main traits of the applicants to enter to teacher programs?
- What are the requirements needed to be accepted in this program?
- What are the differences between teacher preparation at the undergraduate level of education and teacher preparation at the graduate level in Lebanon?
- Is there any difference between teachers' preparation at private universities compared to public university?
- What aspects do teachers receive while studying in the program?
- How valid and reliable data should be collected to reflect the content knowledge and the pedagogical competence of teachers after graduating from the program?

Due to the hard work and limitations of resources to cover the entire questions, the author will provide answers that reflect the systematic efforts in collecting the required data.

## Mathematics Teachers' Preparation

Let us look first at what students supposed to learn and know about mathematics then compare it to what is being taught in Lebanon. In the last forty years, the national council of mathematics in USA set several standards and skills needed for students to master knowledge in mathematics. After the release of *curriculum and evaluation standards for school mathematics* in 1989 by the national council of school of mathematics (NCTM) members, several countries adopted these standards and applied them to their curriculum including Lebanon. This approach triggers the need to prepare both pre-service and in-service teachers to master mathematical skills and to develop conceptual understanding.

After releasing the *Principles and standards for school mathematics* by NCTM in the year 2000, they published in literature several updates related to theory and practices. These *principles* consist of five content and process standards, the content standard are algebra, number and operations, measurement, geometry, and probability and data analysis, the process standard consists of reasoning and proofs, problem solving, communication, presentations, and connections. Students should achieve these standards at each level from kindergarten to k-12 classes. These standards are added to six principles for school of mathematics: curriculum, equity, assessment, teaching, learning, and technology. The center of educational research and development at the Lebanese government (CERD) adopted these standards and principles and began to train teachers, then reported in the year of 2005 that they were familiar with them.

Later on and in the year 2010, the CERD trained intermediate and secondary teachers the new focal points released by the NCTM (*curriculum focal points for*

*prekindergarten through grade 8 mathematics: a quest for coherence*), and this document contained fundamental guidance on mathematics topics that learners should achieve at each grade level in schools.

The educators at the tertiary level drew attention to the preparation of pre-service teachers and adopted a new curriculum to meet the standards. The aim was to prepare pre-service students to teach mathematics according to new standards for the aim of a higher quality teachers, which in turns reflect on students' outcomes. In literature, many researchers argue that higher educational institutions responsible of teacher preparation play an important role in improving the quality of teacher performance, so the future of the nation is well secure. Thus, the new curriculum led higher institution responsible of teacher preparation to demand expectation from teachers in both pre-service and in-service programs.

To answer the questions above, we need to have an overview of the teaching preparation programs offered in Lebanon, these programs differ in their pathways, and this diversity includes the quantity and content designated, duration and timing of the fieldwork, types of the programs, and type of institution offering these programs.

Motivating pre-service teachers and specifically mathematics teachers in Lebanon is prepared in two types of higher institution: public and private. The public institutions as the faculty of pedagogy, center of research and development, and the department of pedagogical support. These institutions are in direct contact with the ministry of education; the first institution prepares pre-service teachers, while the rest deal with in-service teachers (training, counseling, and guidance) with a complete collaboration between all of them. Private universities also have teachers' preparation programs; students will be enrolled after finishing their bachelor major; none of these universities offers pre-service teacher preparation in an undergraduate level of education.

Let us have an overview of the faculties of education at the Lebanese Universities.

## **Public University**

To be accepted in teacher program at both undergraduate and graduate levels at Lebanese University faculty of pedagogy, the students should pass a comprehensive exam in mathematics related to mathematical content skills needed to teach grade one to grade six for undergraduate level and secondary for graduate level. After passing the comprehensive exam, the students will be subjected to an interview by a committee of three to four professors to check his/her ability to do math and teach it.

The European commission stated that Lebanon has a high literacy, and most universities have agreements with one or more institutions in Europe, Canada, or in the USA where during the year 2015, around 14,000 Lebanese students traveled outside the country seeking degrees abroad. In the year 2018, the international conference on Science and Education reported that more than 79,000 of the students are

enrolled Lebanese University in which 2698 are in the faculty of pedagogy known in 1951 as the high teacher's institution then renamed the faculty of pedagogy in 1976.

The goal of the faculty is to prepare and train elementary and secondary teachers. According to the Bologna-reformed European system of higher education, the faculty of pedagogy at the Lebanese University implemented three consecutive cycles; a bachelor degree (3 years) known as license in the French system, a master (2 years) and a doctorate (3 years) degrees. The Bologna reform in addition to the American reform has main objectives as promoting mobility by overcoming legal recognition and administrative obstacles, adopting a system of easily readable and comparable degrees. In the academic year 2008–2009, the faculty of pedagogy implemented the LMD program in the three cycles of education with the use of the European credit transfer system. The programs of study in the French-structured institution; the faculty of pedagogy is offered in three languages Arabic, English, and French.

The students attend the faculty in three branches; denary for master's level, branch I, and branch II disseminated in Beirut area.

The faculty of pedagogy at the Lebanese University is an applied more than theoretical faculty; it prepares pre-service teachers mostly for public schools at the elementary level and for both public and private secondary schools at the masters' levels. In addition to a bachelor degree for science and mathematics teachers at the elementary level, the undergraduate branch I and branch II offer various specializations, such as physical and sports education, early childhood, teaching English or French as foreign languages. In addition to these specializations, the master level offers a master of school counseling, educational supervision, educational administration, and special education. The fourteen weeks' semester in mathematics education allow students to register for 18 to 30 credits and attend eight courses, which vary from free to optional and compulsory as 52 courses.

The courses required for the pre-service mathematics teachers range from theoretical (e.g., development of educational thought), or practical (technology in teaching), or applied (classroom observation), some courses are required according to the specialized track, and the others are optional but end up to be compulsory due to the lack of diversity in courses. All didactics courses are offered in both foreign languages French and English, while social and general education common between all specializations are offered in Arabic language. Based on the LMD system, the assessment of the students is based on two partial exams, which comprise class presentations, quizzes, and projects and count for 40% of the final grade and one summative final exam that count for 60%. The method of instruction in the didactics courses follow the constructivism approach, while other courses still use the traditional method of instruction.

## **Private Universities**

Private universities in Lebanon offer teachers' preparation programs called teaching diploma (TD); the faculty of pedagogy at Lebanese University does not offer this

diploma. This program is offered to graduate students for a better potentials and teaching skills needed in the market. The only requirement to enter this program is having a bachelor degree in any major related to the topic taught at schools (sciences, mathematics, and social sciences).

This program is not designed as a requirement needed to teach at Lebanese schools, but some in-service teacher enroll in this program in order to acquire teaching skills and new methodologies. Moreover, most of graduate students and in-service teachers prefer such program due to the short period of the program (two semesters) compared to the master degree (2 years) offered by the Lebanese University faculty of pedagogy.

Most of private universities have similarities in teaching mathematics programs, and the students have to complete 18 credits in mathematics and mathematics education in which six of them are general pedagogy courses. The content of the mathematics courses is similar, consists of mathematics introductory courses and pedagogical mathematical basis of various approaches in teaching of mathematics in the elementary and secondary schools. The first mathematics pedagogical courses include demonstrations, applications, and classroom observation. The second mathematics course, which based on preparation of teaching and learning materials, tests and plans to be applied in the classroom. Moreover, some universities add supervised practice teaching, individual and group meetings.

Although most of these programs in private universities are similar, they differ in the fieldwork; six credits are required for universities following the American system, while a one-year fieldwork is required for universities following the French system. The period of practice for the fieldwork is the only difference between the programs, but the content of the practicum course—as named by these universities—consists of observation and practices in the presence of the university course instructors and cooperating with school teachers.

It is important to note the absence of university-level programs for the preparation of the intermediate school mathematics teachers. This absence reflects a weakness in the minimum credits required for the fieldwork and influences classroom practices of the teachers after graduation.

Although teachers' preparation at both the public and private institution follows the international standards, studies point on several gaps concerning theoretical framework, application of professional practices, and the discrepancies between different institutions. Moreover, studies showed absence of the connection between what teachers learned and what they will practice at schools after graduating. This weak connection is due to the lack of follow-up of pre-service teachers when they will be in service.

Moreover, a lack of studies concerning the attitudes of supervisors, students, and in-service teachers about these programs, even though these studies enlighten both pedagogical and subject content in these preparation. Therefore, a main recommendation is that the programs should be standardized for all the country and under the follow-up of the government institutions.

Another issue should be raised, the matter of contractual teachers which have a negative effect on the process of teaching and learning. These teachers are hired in Lebanon according to political consideration, which prevents the recruitment of

well-prepared teachers. The solution is a certification set by the ministry of education, and the recruitment of teachers should be under this certification only.

In addition to the issue of recruitment of teachers, the continuous development of in-service teachers is subjected to the international aids from organizations, which much needed to support and improve teachers' practices in the classroom.

## Nature of Teacher Education in Lebanon

The quality and the strength of students' outcomes are related to teacher ability to deliver pedagogical content and apply them with motivation and sensitivity in classrooms. Therefore, the program needed for teacher education should be a combination of education, research, and training.

Moreover, these programs should train teacher to face challenges and develop his/her proficiency in the profession. Teachers should not be prepared as technicians but should embrace pedagogical theories, teaching, and professional skills, and this combination will make them achieve the right knowledge.



## Teacher Education in Lebanon

The perception about the performance of the education system in Lebanon occupies the 75<sup>th</sup> percentile globally in terms of perception of education quality (at the rank 37 from 141 countries according to World Bank). However, perception is different from reality where according to the World Bank in 2018, Lebanon is at the 36<sup>th</sup> percentile globally in terms of learning outcome, which determines the metrics of success in education.

Therefore, the demand for high quality teachers' preparation is a major concern in Lebanon, and students' performance in public education as well as private education is a key element to recognize the quality of teachers and set plans for improvement under the No Child Left Behind legislation. Therefore, one of the keys to look at is the reasons that aspire teachers as expected compensation when graduating, status

of finding easily a job in Lebanon, and their opportunities while working in the field to get a continuous professional development.

The center for research in education in Lebanon made several recommendations in the last 15 years regarding teacher preparation, but the most important recommendation is to ensure the quality of teaching force with mainly the help of universities. Although, we cannot cover all the issues related to teacher quality, but we will emphasize on the main factors affecting this preparation in Lebanon. Professional development of teachers, which represents an enormous industry in Lebanon and attempts to rely on indicators of teachers' college experiences. One of these indicators is the number of courses teachers take in their particular subjects to represent the extents of teachers' knowledge, the pedagogical preparation of teachers, and finally the number of hours they will be practicing teaching in the field.

The organization of Lebanon schooling as three stages: elementary (kindergarten through grade 6), intermediate (grade seven through 9), and secondary (grades 10 through 12) manifests big challenges for mathematics education. Different age group exists at each of these levels, which introduce distinct character that reflects the need of particular educational preparation and development needs.

While mathematics teachers at the secondary level are prepared as specialists in their content area, most elementary teachers teach all subjects except teachers prepared at the faculty of pedagogy at Lebanese University; they are prepared to teach content area (usually mathematics and science) at the level of elementary education.

With the absence of preparation at the intermediate level, mathematics teachers prepared for secondary education are those teaching these levels.

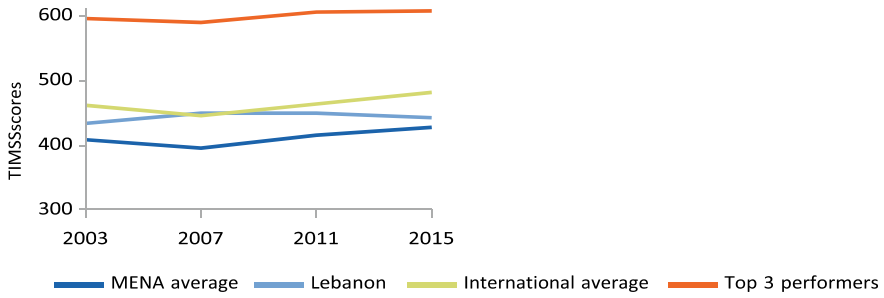
This will raise a question about the necessary instructional steps to support successful mathematics students. The key is to discuss how the students learn; mathematical prior knowledge, skills required to do mathematics, and finally mastering different strategies when solving mathematical problems.

Students' intuitions and resourcefulness brought to class are important because what students hold as misconceptions may interfere in the learning process; moreover, thinking that mathematics is only for smart people will make them struggle and consequently give up on learning mathematics.

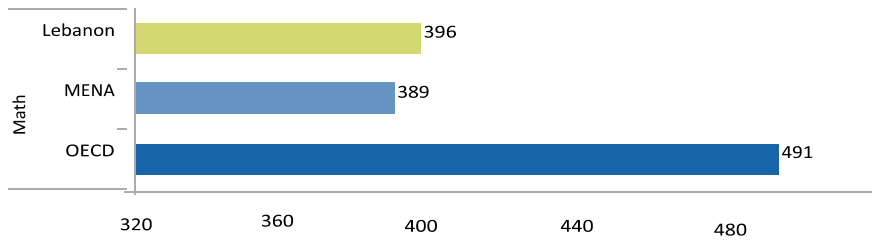
Regarding the skills needed to do mathematics, the students build a path to understand mathematical concepts and apply them.

## **Teaching and Professional Skills**

Students' performance in mathematics has been significantly lower than other countries in the region with declining trends as measured by international learning assessment. In the year 2018, the performance of math students in Lebanon recorded lower values than international records in both Trends in International Mathematics and Science Study (TIMSS) and Program for International Student Assessment (PISA)



**Fig. 16.1** TIMSS 8th grade math. Source: Education Statistics (EdStats) (database), World Bank, Washington, DC, <https://datatopics.worldbank.org/education/country/Lebanon>. Note: MENA = Middle East and North Africa; TIMSS = Trends in International Mathematics Study



**Fig. 16.2** PISA 8th grade math scores. Source: World Bank, 2016. Note: MENA = Middle East and North Africa; OECD = Organization for Economic Co-operation and Development; PISA = Program for International Student Assessment

and TIMSS tests as presented below from 2003–2015 compared to the region and globally.

TIMSS scores in math 2003–15 (Fig. 16.1).

PISA 2015 scores in math and science (Fig. 16.2).

Therefore, these results highlighted the shortage of highly qualified mathematics teachers, which has been a major concern and impassionate topic for discussion in Lebanon in the last 30 years.

The Lebanese system divided into three stages—elementary level (kindergarten to grade 6), intermediate level (grade 6 to grade 9), and secondary level (grade 10 to 12)—in both private and public sectors needed different sort of mathematics preparation for each level.

The professional development of teachers in Lebanon encloses strategies, practices of different techniques as computer, counseling, interpersonal, and classroom management skills. Pre-service teachers at the faculty of pedagogy enrolled in both programs will achieve these strategies by training and practice in order to plan instruction and produce reinforcement and effective assessment. Upon graduating, the faculty of pedagogy assesses their students according to these strategies in order to make sure they will graduate with the practices needed.



At the same time, many mathematics teachers in Lebanon who teach intermediate and secondary schools lack the required professional skills and content preparation. This situation has been a concern for a long time, and it requires attention to assess the status of teachers at schools and make sure they receive the adequate training.

Researchers proved that teacher's knowledge and skills have a strong influence in their practices. The recommendations of many mathematical councils in Lebanon were about taking more courses in mathematics in order to improve teachers' mathematical skills. Regarding teachers prepared at Lebanese University, pre-service elementary mathematics teachers usually take 12 semester-hours on basic and essential ideas of elementary school mathematics, while pre-service secondary mathematics teachers complete a 6-h fundamental course connecting their university mathematics courses with the needed high school mathematics. Many researchers proved that students, whose teachers completed many mathematics courses in their preparation, perform better on achievement tests than students whose teachers took fewer courses in their preparation. Noting that little evidence to what extent this course work will affect students' performance especially after the proof that teacher should think from the learner perspective in addition to being fluent in mathematics.

In addition to the Lebanese University, the center of research in education is another source on how mathematical teachers are prepared and the requirement needed for preparing mathematics teachers. To teach at Lebanese schools, majoring in the subject area is required to teach; no certification or tests are required before hiring, and only interviews that assess the mathematics knowledge necessary to teach. Teachers prepared at Lebanese University faculty of pedagogy have more advantages for being hired since they have the preparation needed to succeed in class.

The recruitment of the teachers in Lebanon does not follow the procedure set by other countries where the requirement is to have attend and pass a pre-service teacher program to get a teachers' certification. This was not the case before the 80's, the law specified passing the program of the Lebanese University to get a certificate, and consequently, it was the requirement for hiring in this profession. Moreover, it can be noted the existence of a teacher program for the intermediate level of education disappears after 1980 due to political issues. In addition to the disappearance of the certification after the teacher program, the increase of recruiting contractual teachers with no teacher preparation programs indicated a decline in the performance of the students due to the absence of coherent policy of recruitments. Moreover, the tremendous increase in the political recruitment of the contractual teachers and the political interference in the in-service teachers' preparation leads the Ministry of Education to be unable to monitor the performance of new recruited teachers.

## **Pedagogy**

The effectiveness of teachers' preparation and training usually explores teachers' thinking, their pedagogical and content knowledge (PCK).

The important questions in this part are what pedagogical practices teachers in Lebanon use. Are these practices effective on the learners and under what conditions? Finally, does school curriculum support effective pedagogy?

Therefore, we will discuss how teachers are applying pedagogical theories and mainly constructivism in their classes, moreover where these practices are identified as successful. The last question investigates how the Lebanese curriculum set by the center of educational research and development and followed by both public and private schools is the main reference for teachers in their pedagogical strategies and practices. Thus, how teachers' preparation introduces teachers' to the pedagogy in the curriculum and in their teaching profession.

Pedagogy itself involves the set of practices or activities that induce changes in the learners in which teachers gained during their preparation program and define their approaches.

During teachers' preparation at the faculty of pedagogy, the students practice all type of pedagogical approaches in their training. Studying theories are present in addition to practicing these theories in real classes. These practices comprise:

- Practicing visual presentations (using technologies or white boards, learning aids) to build their new knowledge and understand in order to be prepared to present it to the learners.
- Prepare teachers for spoken tasks as communication and parley (explanation, questioning, responding, and management talk)
- Learn how to explore new tasks to cognitively engaging learners with new mathematical content; the tasks involve problem solving, mapping, experimentation, and other practicing tasks.
- Master the act of remediation, intervention, and both formative and summative assessments.

All these tasks are included in the teachers' preparation, and students need to master them in order to graduate from both undergraduate and graduate programs at the Lebanese University.

Theories of learning are taught to the students' teachers in one course, and these theories are supposed to be applied in another two courses and in all their practices during their preparation. The theories covered are the behaviorism, constructivism, and social constructivism. Table 16.1 summarizes the theoretical schools that support different pedagogies in Lebanon.

## Curriculum

The main tools for teachers in classroom are the curriculum, particularly in Lebanon where it is presented in the official textbook. Students' teachers learn this curriculum from both the center for research in education where the main and specific objectives are listed and explained and from the official textbook. A course of curriculum is

**Table 16.1** Theoretical schools of thought and associated pedagogies

<b>Theories</b>	<b>Corresponded pedagogy</b>	<b>Pedagogies in developed countries</b>	<b>Pedagogies in Lebanon</b>
Behaviorism	Teacher-centered learning “performance,” visible pedagogy	Cooperation between all students in the class, and the whole class are working together. A particular sequence for mastery of skills	Direct instruction, acquisition of learning, demonstration, lecturing, imitation
Constructivism	Child-centered learning “competence” or invisible pedagogy	Conceptual, individual work, project, and activity	Activity-based learning
Social constructivism	Student centered guided by teacher	Mainly group work under strategies, flipped classroom, communication between teachers and learners	Group work, think-pair-share, communication between students, teacher high-level questioning, inquiry-based, problem-solving

given to them during their preparation to discuss the learning objectives in each level class.

Unfortunately, some schools in Lebanon teach mathematics content as content-driven curricula where the key concept is discipline in order to finish the material on time, throwing all the theories of teaching and having full control from the teacher on the class. This is due to the exams set by the government at the end of grade nine and grade 12, the teacher has to finish the material in order to prepare his students for these exams. Although in some schools, this code is applied, and teachers graduating from universities and well prepared use curriculum as structured round sets of expected learning outcomes.

Curriculum has the power for social change in which what the society will be in the future. This reform usually resisted by many educators, but students’ teachers prepared are ready for the change and implementing this change in their practices at schools.

The center of education and research development (CERD) is the main center to design the national curriculum and texts books. In addition, the center prepares in-service public teachers’ training once a year, but it does not have any communication with private schools except with the use of the Ministry of Education, which inform the private sector about the new change in textbooks and curriculum.

Moreover, we can identify some recommendations to improve education quality for curriculum and recommend to be applied by the center of education and research development (CERD):

- A strong collaboration, alignment, and harmonization in activities offered to in-service teacher should be implemented between Lebanese University, CERD, and the Ministry of Education.
- Continuous assessment to public and private teachers to reinforce and improve teachers' practices.
- The follow-up of the teachers after the training is necessary for continuous reform of teachers to collect evidence on applying what they learned to improve students learning outcomes.

Finally, the improvement of working conditions for the CERD staff as for recruitment and assignment practices was very competitive and attracted professors, but nowadays, these conditions have not remained the same and need to be improved for better outcomes.

## Conclusion

After reviewing how mathematics teacher preparation in Lebanon is conducted and what the requirement for hiring are, we need to note four clear points; first, the information available suggested that public and private preparation programs are not meeting the expectations for hiring in Lebanon specifically the absence of government license at the end of the programs. Second, a strong basis exists in these preparations especially the one done by the Lebanese university regarding the mathematics content and pedagogy. Third, the lack of undergraduate programs at universities leaves the responsibility to prepare elementary mathematics teachers to only the Lebanese University, which represents a lack of competition to improve these programs. Fourth, the absence of the intermediate-level preparation of the mathematics teachers leaves a gap in these programs, which appear in the results of the students at the end of the intermediate levels or in the international tests.

After discussing the strong evidence of the correlation between teachers' high mathematical knowledge and achievement of the students, we suggest a collaboration between the departments of mathematics and the department in education to provide teachers candidate with higher mathematics content in addition to pedagogical learning provided by the department of education.

To conclude, the system of education in Lebanon is a national pride, and in particular, mathematics education receives full support socially and politically. Thus, Lebanese people are willing to invest in their children education especially mathematics education to ensure in their opinion scientific enrollment in tertiary education.

Regarding teachers' preparation, mathematics teachers like the rest of teachers are very qualified when graduating from the faculty of pedagogy at the Lebanese University, and they have the freedom to associate which provide diversity in education as different languages and international curricula.

Given the lack of evidence on the effectiveness of the private universities approached to prepare teachers, additional research is needed. Moreover, more institutions are needed to prepare teachers at all levels, in particular at the intermediate level for a better development of effective teachers.

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