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Didactics of Mathematics in Tunisia: Achievements and Challenges

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Abstract

The passage from elitist education to mass education during the second half of the 20th century led the actors of the Tunisian educational scene and the mathematicians to ask themselves questions related to the teaching and learning of Mathematics. From the seventies, the ATSM (Tunisian Association of Mathematical Sciences) began to take an interest in a new science called The Didactics of Mathematics through frequent participation in international conferences on mathematics education. Thus, a dynamic was born and developed, little by little, in Tunisia to lead in 1998 to the establishment of a DEA (**Diplôme d'Etudes Approfondies**) in the Didactics of Mathematics at the ISEFC (Higher Institute of Education and Continuous Training). It is now twenty-four years since then. Therefore, we believe it is crucial to take stock of the achievements made since the first class launch and point out the shortcomings and difficulties accompanying this development. Hence, this paper will expose the conditions in which the training was launched and how it has evolved over the years. We will also describe the specificities of the research carried out by Tunisian students and researchers, the current professional status of graduates in the Didactics of Mathematics, and the influence of Mathematics dialecticians in national and international settings. Finally, of course, we will point out some of our concerns about the survival of this discipline in Tunisia throughout this article.

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Introduction

The passage from elitist education to mass education during the second half of the 20th century led the actors of the Tunisian educational scene and the mathematicians to ask themselves questions related to the teaching and learning of Mathematics. From the seventies, the ATSM (Tunisian Association of Mathematical Sciences) began to take an interest in a new science called The Didactics of Mathematics through frequent participation in international conferences on mathematics education. Thus, a dynamic was born and developed, little by little, in Tunisia to lead in 1998 to the establishment of a DEA (**Diplôme d'Etudes Approfondies**) in the Didactics of Mathematics at the ISEFC (Higher Institute of Education and Continuous Training). It is now twenty-four years since then. Therefore, we believe it is crucial to take stock of the achievements made since the first class launch and point out the shortcomings and difficulties accompanying this development. To understand the evolution of the teaching of the Didactics of Mathematics in Tunisia and to present the state of play of this discipline today, we believe that it is essential to begin by briefly describing the historical context prepared for the launch of this university training.

The Historical Context

The Tunisian Association of Mathematical Sciences (ATSM) is the first association in Africa and in the Arab world to bring together mathematics teachers. It was created in 1968 to improve Mathematics education and the diffusion of the scientific culture in Tunisia. This association has played a central role in disseminating the didactic culture among the actors of the educational scene. Since its creation, it has insisted on being present in major international scientific events related to the teaching and learning of mathematics. Thus, many teachers and inspectors of Mathematics have imbibed the Didactics of Mathematics because of their recurring participation in international conferences on the teaching of Mathematics, such as that of Lyon, which took place in 1972, and in the National Days of Mathematics Teachers Associations in France, Belgium, or Switzerland. Furthermore, since its creation, it has organized multiple national study days on the teaching of Mathematics, as well as many summer schools around different themes related to the teaching and learning of Mathematics.

In 1977, the ATSM and the ENS (Ecole Normale Supérieure de Tunis) welcomed Guy Brousseau as a guest of honor to present the Didactics of Mathematics to a large public of teachers. Those days marked many actors in the Tunisian educational scene who discovered this field of knowledge for the first time.

It should also be noted that during all these years and until today, the ATSM has offered Tunisian teachers and researchers a space for publishing articles on the teaching and learning of Mathematics in its magazine Miftah al-hissab. Besides, at the end of the seventies and considering that the Didactics of Mathematics is essential in the training of future teachers, a certain number of Mathematics university teachers working at the ENS[2], have promoted this discipline to integrate it into the training course of the students[3] (Abdeljaouad, 2009). The teaching of the Didactics of Mathematics continued in the ENS of Bizerte. Still, unfortunately,

[2] Ecole Normale Supérieure de Tunis is Tunisia's oldest modern university institution. It opened its doors in October 1956 when Tunisia gained its independence. Its mission was to ensure the training of high-level teachers that the country badly needed. In 1982, this school split into two institutions (one specialized in the fields of Arts and Humanities bearing the name of Ecole Normale Supérieure de Sousse, and the other specialized in the scientific fields bearing the name of Ecole Normale Supérieure de Bizerte).
[3] Professors, Claude Tisseron and Pierre-Edouard Gauthier, contributed, at that time, to the setting up of a didactics course in the Didactics of Mathematics at the ENS.

it stopped a few years later after the transformation of the school into the Faculty of Sciences of Bizerte in 1990.

The Higher Institute of Education and Continuous Training (ISEFC) was created in 1982. This institution, which is now attached to the Virtual University of Tunis, was founded mainly to provide continuous training within the framework of Master of Teaching (Mathematics, Physics-Chemistry, Life and Earth Sciences, Computer Science, Arabic, French, History-Geography, etc.), to primary and secondary school teachers attached to the Ministry of National Education. Over the years, and according to the needs of the Ministry of Education, the ISEFC has multiplied its services. For years, it has ensured the preparation of secondary and primary inspectors for recruitment competitions, trained laboratory technicians in higher and secondary education, prepared for the CAPES (The Certificate of Aptitude for Secondary Education Teaching), etc.

Due to its educational missions, the ISEFC has become a meeting place for many opinion relays from the academic scene, particularly those who campaign for better mathematics teaching and learning. The rapprochements between the objectives of the ATSM and those of the ISEFC have naturally led the ATSM to set up its main office on the premises of the ISEFC. These physical connections and the strong involvement of the ISEFC and the ATSM managers have created a dynamic of reflection on the need to supplement the academic training of teachers with training in the Didactics of Disciplines and mathematics.

Under the special impetus of Professors Malika Trabelsi Ayadi (Director of ISEFC), Mahdi Abdeljaoud and Samir Marzouki (former directors of ISEFC), Ahmed Chabchoub (President of ATURED), etc., a national competition was required in 1993 to select three candidates.[4], among many others, who will continue their studies (DEA and Doctoral) in the Didactics of Mathematics in France. This dynamic has continued at the ISEFC, which launched within its premises and, for the first time, studies at the level of the DEA in Didactics of the various disciplines. The 1998-1999 academic year was marked by the launch of the DEA in the Didactics of Mathematics[5]. Today, the ISEFC has a doctoral school, "Didactics, Teaching Sciences, Education and Training Professions" (DISEMEF), established in 2003 to federate doctoral studies in Didactics of Disciplines and Education Sciences.

The Launch and the Evolution of the Training

To ensure good DEA training in the Didactics of Mathematics, the ISEFC has multiplied partnership projects with French research laboratories working in the field of Didactics of Mathematics. These laboratories are LIRDHIST (Lyon1 University), LEIBNIZ (Grenoble1 University), LACES (University of Bordeaux), and DIDIREM (University of Paris 7). It should be noted that the French Institute of Tunisia (IFT) has played an essential role in establishing these various collaborations. It has financed missions for French teachers so that they can intervene in the DEA in Tunisia. It also has funded research internships for Tunisian students in French partner laboratories. The IFT has also enriched the library of the ISEFC by making it acquire a necessary documentary background on the Didactics of Disciplines.

[4] They are Hanène Abrougui, Mondher Tangour, and Mohamed Essahbi El Amri, who obtained their doctoral thesis successively from the University Joseph Fourier-Grenoble in 1998, from the University of Bourgogne in 1999 and from the University Claude Bernard-Lyon in 2001.

[5] Once again, Professors Malika Trabelsi Ayadi, Mahdi Abdeljaoud, and Ahmed Chabchoub have contributed significantly to the establishment of this training. It should also be noted the considerable role played by Claude Tisseron, director of LIRDIST-Lyon1 (Interdisciplinary Research Laboratory in Didactics of Science and Technology) at that time, in setting up the training and supervising some students.

Abdeljaouad[6] (2009) specified that the selection of the first candidates took work because it was necessary to consider extra-academic elements while choosing future students, in addition to the strict criteria related to the candidate's academic dossier. Indeed, as there was not enough visibility concerning the destiny of the future graduates in the Didactics of Mathematics because of the uncertainty related to their employability after the training, the jury preferred by examining the files of the candidates to retain only those who were already teachers holding their position in the national education. Regarding the academic criteria, the jury retained only the candidates for the oral interview. They had their master's degree in mathematics in at least five years, with good grades. Furthermore, proficiency in French was an essential criterion for selecting candidates during the oral interview. This criterion is justified by the fact that the lessons are given in the language of Molière and that the students are required to write their DEA dissertation in French. The first class (1998-1999) had ten students chosen from among sixty-three applicants.

Tunisian and French teachers intervened in the DEA of Didactics of Mathematics during the first years. The Tunisian teachers are not, of course, graduates in the Didactics of Mathematics. They are mainly Mathematics university teachers who have affinities concerning the questions related to the teaching and learning of Mathematics or the Sciences of Education.[7]. The French teachers are members of the research laboratories that are partners with the ISEFC. They are experts in the Didactics of Mathematics.[8]. Currently, the training within the framework of the master's degree is exclusively provided by Tunisian teachers, the majority of whom are doctors in the Didactics of Mathematics[9]. The others are doctors in Education, Science[10] or the History of Mathematics[11].

Within the DEA framework, the Mathematics Education training occurred over two years. The first year was organized into two semesters devoted exclusively to teaching. The second was dedicated to writing the research dissertation and the oral defense. Below, we will present the general organization of the first year:

Semester 1: The students received training standards for all didactics this semester. In addition to French, English, and an introduction to Computer Science, the students took courses in Learning Theories, Assessment Theories, and Education Sciences Methodologies. These courses were provided by Tunisian teachers specializing in education sciences.

Semester 2: This semester, students received specialized education in the dynamics of mathematics. There are five modules[12]: Fundamental Texts in the Didactics of Mathematics, Applications of Didactic Concepts to the Teaching of Mathematics, Initiation to Research in the Didactics of Mathematics, the History and the Epistemology of Mathematics, Evaluation in the Didactics of Mathematics, and New Technologies. French teachers taught these modules as part of the cooperation between The ISEFC and the French didactics research laboratories. On average, each module was introduced in thirty hours a week. Naturally, then, the students

[6] Mahdi Abdeljaouad was one of the members of the candidate selection jury.

[7] It is about professors Mahdi Abdeljaouad, Hikma Smida, Faouzi Chaabane, Karim Boulabiar, Hanène Abrougui Hattab (the first doctor in Didactics of Mathematics), Marouan Ben Miled (Historian of Mathematics), Ahmed Chabchoub, Noureddine Sassi and Mohamed Ben Fatma.

[8] It is about professors Claude Tisseron, Colette Laborde, Gérard Vergnaud, Sylvette Maury, Nicolas Balacheff, Viviane Durand-Guerrier, Isabelle Bloch, Brigitte Grugeon, and Hamid Chaachoua.

[9] It is about professors Feiza Chellougui, Imen Ghedemsi, Rahim Kouki, Sonia Ben Nejma, Faten Khalloufi, Imed Kilani, Sassi Haddad, Mounir Dhiab…

[10] Abdelmajid Naceur, Najoua Ghriss.

[11] Marouan Ben Miled.

[12]The boundaries between the modules taught in the second semester must be clarified. This could be explained by the need for more clarity on what was required to be taught—moreover, even the titles of the courses needed to be clarified.

were obliged to organize themselves well to be able to free themselves entirely from their professional commitments and to pursue these courses. Unfortunately, this constraint led some students to abandon the training.

In September 2006, the DEA in the Didactics of Mathematics was transformed into a Master's[13]. Since then, four accreditations have emerged so far. As for the first accreditation, the training was grouped into three semesters. The modules previously done as part of the DEA in two semesters are grouped into one semester. The second and third semesters were dedicated to a seminar on research methodology and dissertation writing. A new organization was set by the second accreditation, which entered into force at the start of the 2010 academic year. It organized the training into four semesters. The first and second semesters were devoted to the teaching of sixteen modules. The third semester was dedicated to introductory seminars on the research methodology, and the last one to the writing and the dissertation defense.

Regarding the modules taught in the first and second semesters, they were grouped according to four axes as specified by Chellougui and Durand-Guerrier (2016):

Axis 1: Didactics of Mathematics.
Axis 2: "Fundamental Mathematics" to deepen specific mathematical knowledge.
Axis 3: Classical and Digital Pedagogy.
Axis 4: Research Methodology.

Even if there are some differences in the modules taught, the third and fourth accreditations are organized similarly: the lessons are spread over the first three semesters of the training. At the end of each semester, the students take exams. The fourth semester is dedicated to writing and the dissertation defense.

Twenty-Four Years of Didactics of Mathematics

Twenty-four years have passed since the first class of didacticians of mathematics was launched at ISEFC. In total, two hundred and fourteen students were trained. Fifty-eight DEA and master dissertations and twenty doctoral theses (almost all are carried out jointly with French universities) are accomplished. In addition, two international students (Algerian and Palestinian) carry out two theses within the cooperation framework. Currently, twelve theses (some are exclusively Tunisian, and the others are co-supervised) are in progress, two of which are prepared by international students within the cooperation framework. The table below will present the percentages of DEA/Masters/Doctorate graduates compared to the total number of registered students since the training launch in 1998. Likewise, we will present, in this table, the percentage of doctors compared to the number of DEA/master's graduates**.**

Table 1

Overall Assessment of Training in the Didactics of Mathematics in Tunisia

Percentage of DEA/Masters graduates relative to the number of students registered	Percentage of Doctors relative to the number of students registered	Percentage of Doctors relative to the number of DEA/Master graduates
27%	9%	35%

[13] The master is part of the LMD (Bachelor-Master-Doctorate) reform led by Tunisia.

We noticed that only 27% of the students passed the exams and could defend their research dissertations. The others either gave up during the training, failed the exams, or needed help completing their dissertation.

The percentage of doctors compared to the total number of students registered in one of the DEA courses or Masters in the Didactics of Mathematics is around 9%. There has been a decrease in the number of doctorates accomplished in recent years. This phenomenon is generalized in many specialties. It can be explained by the need for more visibility and the uncertainty related to the employability of doctors after training, as the number of open positions of teacher-researchers in Tunisian Higher Education is constantly decreasing. Despite this challenging situation, 35% of students with a DEA/ master's degree in the Didactics of Mathematics could continue their training and obtain a Doctorate Degree. It should be noted here that this relatively high percentage emanates from the students of the first promotions who were very motivated and well-supervised[14]. It should also be noted that three doctors in the Didactics of Mathematics, among the twenty, succeeded in having their Habilitation to Direct Research (HDR).

DEA/Masters/Doctorates according to Different Educational Levels

In Tunisia, education is compulsory until age 16, and the pupil can only be definitively excluded from all public schools in extreme cases and for serious misconduct. The Tunisian education system is globally organized into five levels:

- Non-compulsory nursery education (from 3 to 6 years old).
- Primary education of the first cycle, lasting six years, is provided in primary schools.
- Primary education for the second cycle, lasting three years, is provided in preparatory schools (Collèges).
- Secondary education, lasting four years, is provided in secondary schools and culminates with the baccalaureate diploma. The first year is a common core. The following three years, they occurred in one of the six streams: Arts, Mathematics, Experimental Sciences, Economics and Management, and Computer Sciences.
- University education is dictated by the LMD system (Bachelor-Master-Doctorate**)** for all training except engineering, medicine, and architecture sectors.

The transition of primary/middle school, middle school/secondary school, and secondary school/ university often marks disruptions, particularly in the teaching and learning of Mathematics. For example, the transition from primary to middle school is characterized by code changes in mathematical writing and the need to move from inductive to deductive logic. The transition from middle school to secondary school is accompanied by the passage from Arabic to French teaching mathematics. Some research has shown that this passage marks an additional difficulty for Tunisian students in teaching and learning Mathematics (Ben Kilani, 2005; Ben Nejma, 2020; Durand-Guerrier & Ben Kilani, 2004). The table below gives an idea of the distribution of dissertations and theses accomplished according to the level of education.

[14] We need to discuss the reasons for their motivation and the quality of their supervision.

Table 2

Distribution of Dissertations and Theses according to the Level of Education

	Primary	Primary/middle school transition	Middle school	Middle school/ Secondary School Transition	Secondary School	Secondary School/ University Transition	University
DEA/Masters	5	4	12	3	29	3	2
Theses	1	0	1	2	9	2	5

Almost half of the themes of the dissertations and theses accomplished were developed at the secondary school level. This could be explained by the fact that most students and doctoral students are teachers who exercise in secondary school and have a critical view of school programs and textbooks and what is practiced in mathematics classes. Although transitioning from one level of education to another (primary/middle school, middle school/secondary school, and secondary school/university) poses problems for many learners, we notice that there is little research carried out to investigate the difficulties that could arise during these transitions.

We can also note the little research on teaching and learning mathematics at the nursery and primary levels. This could be explained by the need for more knowledge of students and doctoral students of the teaching content at these two levels of education since they practice mainly in middle school and secondary school.

Dissertations and theses produced at higher education level are realized by teachers who were on secondment from secondary education to higher education then. They taught Mathematics because the Tunisian university lacked, at that time, PhDs in Mathematics. This situation no longer exists today; there is a profusion of teachers with doctorates in Mathematics.

DEA/Masters/Doctorates according to Mathematical Fields

The research carried out in Tunisia in Didactics of Mathematics was registered in several mathematical fields: Logic, Language, and Mathematical Reasoning (1), Arithmetic (2), Numerical (3), Algebra (4), Analysis (5), Geometry (6), Statistics and Probability (7) and Graph Theory (8). The following table specifies the distribution of this research according to the mathematical fields investigated[15].

Table 3

Distribution of Dissertations and Theses according to Mathematical Fields

	Field (1)	Field (2)	Field (3)	Field (4)	Field (5)	Field (6)	Field (7)	Field (8)
DEA/Masters	3	4	8	10	10	17	5	1
Theses	3	1	0	6	6	3	1	0

The most explored mathematical fields in the research in the Didactics of Mathematics in Tunisia are Geometry, Algebra, and Analysis. We can also notice that the numerical field, which was quite present in the work of DEA/ Masters, has completely disappeared in the theses. Why has no continuity in thesis research in this same mathematical field? However, a

[15] Research can be found at the crossroads of several mathematical fields. We classify them according to the dominant mathematical field investigated.

lot of thesis work on the numerical domain has been carried out and has shown its didactic relevance (Bronner, 2007,1997; Farias, 2010; Larguier, 2009).

Current Professional Status of Didacticians of Mathematics Graduates

As of September 2022, twenty doctoral students in Didactics of Mathematics have graduated, and thirty-eight students (including postgraduate students who have not yet graduated) have their DEA or master's degrees. In the following table, we specify their current professional status. It should be noted that apart from five students who were inspectors and a pedagogical adviser, almost all the students were teachers of secondary education (PES) or primary education (PEP) at the start of their training.

Table 4

Current Professional Status of Graduates in Didactics of Mathematics

Professional status	DEA/Masters/PhD	PhDs
Professor of Higher Education	0	3
Senior Lecturer	0	6
Retired Senior lecturers	0	3
Inspector	5	1
Retired inspector	0	1
Pedagogical advisor	1	0
PES/PEP	28	1
Retired PES/PEP	2	4
Contractual	1	1
Unemployed	1	0

We note that most DEA/Masters/Doctoral graduates.[16] They have not changed their professional status. For example, those who started training as secondary (PES) or primary (PEP) teachers have kept their status. Furthermore, it should be noted that many students from the first promotions were able, by taking part in the assistantship competition, to be integrated into higher education through secondment and having the DEA with only a thesis progress report. This opportunity, which no longer exists today, encouraged these doctoral students to complete their thesis and obtain their Doctorate Degree in the Didactics of Mathematics. However, currently, and for several years, the situation of Tunisian doctors in all disciplines has become difficult. Indeed, the number of unemployed doctors continues to grow due to a lack of open teaching jobs at the university.

It should be noted that the twelve doctors who are today professors of higher education, senior lecturers, or retired senior lecturers obtained their thesis before 2013. The eight other doctors who have yet to enter higher education obtained their thesis after 2013. Since then, the opening of teaching jobs at the university has become very rare, especially since the intermediate stage of secondment from secondary education to higher education, which facilitated access to higher education for doctors before 2013, has yet to be possible. In the typology of the motivations of the candidates who present themselves to continue their studies in the master's degree of Didactics of Mathematics, Abdeljaouad (2009) notes two motivations concerning the desire of the candidates to leave secondary education and enter higher education:

[16] These are graduates from the classes of 2006, 2007..., 2022.

> "*Difficulties in secondary education: Leaving secondary education becomes difficult due to the new behavior of pupils, which becomes unacceptable. Abandon the chalk and the blackboard to devote me to more noble tasks. These motivations are rarely made explicit. However, they appear implicitly during the interview.*
> ...
> *A desire for social promotion: To have a new diploma and to teach at the university,*"[17] (p4)

It should be noted that candidates also have other motivations that drive them to follow training in Didactics of Mathematics, such as their desire to improve their teaching practices (Abdeljaouad, 2009). Still, this desire to be integrated into higher education is a significant reason that helps them overcome their constraints[18]. Moreover, the scarcity of open positions at the university in recent years and the socio-economic crisis have meant that the number of candidates who want to pursue a master's degree in the Didactics of Mathematics is less critical.[19].

Finally, it should be noted that eight of the twenty doctors have retired without being able to take advantage of their expertise in the field of the Didactics of Mathematics. This represents a regrettable loss, especially as the body of doctors in the Didactics of Mathematics is not being renewed, which may jeopardize all the efforts made for more than twenty-four years to develop this discipline in Tunisia.

Some Achievements of Tunisian Didacticians

Over the years, the cooperation between ISEFC and French research laboratories in the Didactics of Disciplines has weakened. The team's retirement[20] The launched training in the Didactics of Disciplines has negatively affected the dynamic setup at ISEFC to develop this discipline in Tunisia. In addition, as noted by Chellougui and Durand-Guerrier (2016), Tunisian mathematics didacticians have yet to succeed in setting up a specialized Tunisian research structure recognized institutionally. Despite these difficulties, some mathematics didacticians have continued to progress in their research and mark their presence in the national and international spheres.

Establishment of a Tunisian Association of Didactics of Mathematics

Creating a Tunisian Association of the Didactics of Mathematics is quite natural since a small community of Tunisian didacticians has begun to emerge. In 2007, the first doctors turned this dream into reality by creating the Tunisian Association for Didactics of Mathematics (ATDM). This association was created to promote the influence of research in Didactics of Mathematics in Tunisia, to disseminate the didactic culture in the community of teachers, inspectors, and university teachers of mathematics, and to organize scientific meetings between didacticians of Mathematics and actors of the Tunisian educational scene. Since its creation, the ATDM has been keen to organize an annual meeting under a particular

[17] This is our translation.
[18] Candidates have professional commitments, are generally married, have a family, and are often obliged to move hundreds of kilometers to reach the place of training (ISEFC).
[19]Being responsible for the master's degree in the Didactics of Mathematics at ISEFC, over the past two years, we have seen a considerable drop in the number of candidates wishing to register for the master's degree. While we usually receive more than sixty application files, in the 2021-2022 academic year, we only received eleven files, and this year, 2022-2023, we only received thirteen files.
[20] They are Malika Ayadi Trabelsi, Mahdi Abdeljaouad, Samir Marzouki, Ahmed Chabchoub.

didactic theme during the spring holidays, which brings together Tunisian and foreign expert researchers, young researchers who can present their work in progress, Mathematics teachers from all levels, and other actors interested in the teaching and learning of Mathematics. Furthermore, for several years, the ATDM office and didacticians, in general, have been reflecting on the possibilities of creating, under the aegis of the ATDM, a Tunisian scientific journal for the publication of research results in the Didactics of Mathematics. This objective has yet to be achieved but will soon emerge.

A bachelor's degree in "Mathematics for the Teacher."

The ISEFC was mainly founded to provide continuous education for primary and secondary school teachers in various disciplines. It delivers, among other things, a bachelor's degree in mathematics approved by the Ministry of Higher Education. The different science faculties in Tunisia also provide mathematics training within the LMD system's framework. The latter is similar in terms of teaching content. To mark its specificities, the ISEFC has implemented, since September 2019, a new bachelor's degree entitled "MATHEMATICS FOR THE TEACHER." This degree, intended for future primary and secondary Mathematics teachers, results from discussions between Mathematics university teachers and the Didactics of Mathematics[21]. The didactic component in this training is crucial. Indeed, out of a total of 1650 hours of teaching, 670 hours (i.e., 40% of the totality of the training) are devoted to the teaching of the Didactics of Mathematics: Introduction to the Didactics of Disciplines, Introduction to the Didactics of Mathematics, Application of Psychological Theories in the Teaching and Learning of Mathematics, Analysis of Didactic Texts, Views on Research in the Didactics of Mathematics, Evaluation and Didactics, Theory of Situations and Didactic Engineering, Praxeological Modelling and Mathematics Tutorials.

Five hundred hours are dedicated to teaching mathematical foundations and developing mathematical thinking. The rest of the training is devoted to teaching the History of Mathematics, the History of Mathematics Education in Tunisia, the Different Theories of Education Sciences, soft skills, Foreign Languages (French and English), and Computer Science.

The students of the first promotion graduated in July 2022.

A Research Master's Degree in the Didactics of Computer Science

Computer Science Education in Tunisia is done informally in some primary schools. However, starting from preparatory school, teaching this science becomes compulsory and continues until the Baccalaureate. Computer science is also taught in almost all university courses. Didactic questions on how to teach it well frequently arise in the educational sphere as it is primarily a rapidly evolving science.

At ISEFC, the Computer Science Department's mission is to provide university training leading to a fundamental degree in Computer Science. The recurring requests from students to set up master's and doctoral studies in the Didactics of Computer Science, like the Didactics of Mathematics already established for years, motivated the team of didactics of Mathematics to get involved and collaborate with specific university Computer Science teachers to fulfill this request. This is how the ISEFC launched the training of the first Computer Science didacticians in September 2018. The involvement of didacticians of Mathematics in this

[21] It is necessary to note the critical role of Professor R. Kouki, a mathematics didactician, in setting up this master's degree. Due to a lack of Computer Science didacticians, he is currently coordinating this master.

master's has made it possible to set up research projects with students in the context of Mathematics-Computer Science inter-disciplinarity (two Research Masters at the crossroads of Mathematics and algorithms and a master's degree at the crossroads of Mathematics & Object-Oriented Programming).

Tunisian Didacticians in the International Scene

Under the remarkable responsibility of Professors M. Abdeljaouad, A. Achour, L. Lassoued, H. Smida, B. Kachoukh, and T. Charrada, who were very interested in questions related to the teaching and learning of Mathematics[22], and with the considerable involvement and commitment of young Tunisian didacticians of Mathematics, Tunisia organized in Tozeur the International Symposium Espace Mathématique Francophone (EMF) in December 2003, which is held every three years in one of the French-speaking countries. The notable success of this symposium opened the doors for Tunisian didacticians to take on scientific responsibilities in other international events. H. Smida in 2003, 2006, 2009, and 2012, F. Chellougui in 2015, I. Ghedamsi in 2018 and R. Kouki in 2022 were members of the scientific committee of the EMF Congresses. I. Kilani, N. Haj Ali, H. Abrougui, R. Kouki, I. Ghedemsi, M. Abdeljaouad, and S. Ben Othmen were all responsible for one of the Working Groups in one of the EMF Congresses.

The Tunisian presence was also remarkable at the EMF 2012 Congress held in Geneva. Indeed, F. Khalloufi was invited as co-responsible for the project "Assessment, skills, and Guidance in School Transitions: Role of Mathematics." During a plenary session, H. Smida, S. Ben Nejma, and F. Khalloufi also moderated a round table in which they presented their thoughts on curriculum developments in teaching Mathematics in Tunisia. In EMF 2018, held in Paris, F. Chellougui also participated in the animation of a round table with five other dialecticians under the theme "Inter-disciplinarity and Mathematics: Curricular Devices and Prescriptions." She presented the case of Tunisia concerning curricular devices and prescriptions, the anchoring of inter-disciplinarity in the skills-based approach, and finally, the support for research and the evolution of teaching practices.

In 2016, within the framework of the "invited speakers" of the "International Conference on Mathematics and Education" Congress, F. Chellougui was invited to present a conference entitled "Difficulties of Students Engaged on Activities Related to Mathematics Formalism." At this same conference, I. Ghedemsi was a member of a working group of "Teaching and Learning of Calculus."

In 2020, despite the exceptional situation due to the COVID-19 pandemic, Tunisia organized, under the aegis of the University of Carthage and the chairmanship of F. Chellougui, the third conference "International Network for Didactic Research in University Mathematics" (INDRUM). This symposium was held as an online conference, although the organizing committee had prepared everything to welcome the participants to Bizerte. The organizers and the scientific committee were then forced to reorganize the event's calendar in extremis. F. Chellougui and I. Ghedamsi were part of the scientific committee.

In 2022, Tunisia organized the 3rd African Colloquium "ADiMA3" under the aegis of the Tunisian Association of Geomatics (ATG), the University of Tunis el Manar (UTM), and the Virtual University of Tunis (UVT). The ADiMA [Association of African Mathematics Didacticians] Colloquium is recognized as an ICMI [International Commission on

[22]Mahdi Abdeljaouad and Hikma Smida are two university Mathematics teachers regularly present in the commissions of official Mathematics education programs. They have also written several secondary school textbooks. They often participate in national and international events that discuss the teaching and learning of Mathematics.

Mathematical Instruction] Regional Conference. R. Kouki and I. Kilani were successively president and vice-president of the organizing committee, and F. Chellougui was vice-president of the scientific committee. During the symposium, R. Kouki and I. Kilani presented the second plenary conference entitled "Current Situation of Mathematics Education in Tunisia." S. Ben Nejma, I. Kilani, N. Hadj Ali, and F. Khalloufi were co-leaders of working groups. As part of the round table, F. Chellougui presented to a large audience in which she highlighted certain areas of interdisciplinarity developed in the various working groups.

Despite the limited resources available to the Tunisian didacticians of Mathematics group, they have been visible on the international scene, not only through their involvement in the organization of scientific events but also through the dissemination of their research. They have published numerous articles in conference proceedings (EMF, CERME, ICME, EEDM, ADiMA, INDRUM, etc.). They have also published several articles (about forty) in leading journals in Didactics of Mathematics, such as Recherches en Didactique des Mathématiques, African Journal of Research in Mathematics Science and Technology Education, Petit x, Ensino Da Matematica em Debate, Les Cahiers du Français Contemporain, Canadian Journal of Science, Mathematics and Technology Education, Educaçao Mathematica Pesquisa, International Electronic Journal of Mathematics Education, Neurophysiology, Quebec Journal of Mathematics Didactics, ZDM–Mathematics Education, African Journal of Research in Computer Science and Mathematics, etc.

It should also be noted the participation of S. Ben Nejma and F. Chellougui in the writing of two book chapters (Coulange et al., 2012; Winslow et al., 2015) and the co-publication by I. Ghedamsi of a book under the title "Teaching and Learning of Calculus" (Bressoud et al., 2016).

Conclusion

During these twenty-four years of teaching Mathematics, a small team of didacticians has been formed. Despite the limited resources available to this team, it has made considerable achievements nationally and internationally. The original research carried out by this team's members (students and experienced researchers) has enriched the view of the teaching and learning of Mathematics in Tunisia. As highlighted by Chellougui and Durand-Guerrier (2016), this research has permeated specific French studies and contributed to the influence of Mathematics education in the French-speaking world. Three didacticians[23] They have already accomplished their Habilitation to Direct Research (HDR). To strengthen this small team, the other doctors in the Didactics of Mathematics are called upon to pass their HDR for better scientific recognition in the world of research and on the side of the actors of the Tunisian educational scene.

Being responsible for the master's degree in the Didactics of Mathematics at ISEFC, we have noticed a lack of interest in postgraduate studies in the Didactics of Mathematics in recent years. This disinterestedness is not unique to our discipline. Some colleagues responsible for master's courses in mathematics at various universities have also recorded this same problem. The lack of open positions for teachers at the university and the worrying spread of the phenomenon of private home tutoring of Mathematics, as Abdejaouad (2009) noted, are indeed there for something wrong.

One of the difficulties we encounter at the level of teaching and supervising students within the framework of the master's degree is the number of university teachers in the

[23]Feïza Chellougui, Imene Ghedamsi, and Rahim Kouki.

Didactics of Mathematics who can intervene in training, which continues to decrease due to the retirement of some colleagues. Moreover, the commitment of some students to doctoral studies at an "advanced" age will not allow them to have a long-term professional career. This situation raises, among other things, the issue of the viability of the Didactics of Mathematics in Tunisia. Therefore, it is essential to set up an effective awareness-raising campaign with influential actors in the educational scene (as was the case when the DEA was launched) to highlight the importance of the Didactics of Mathematics for better teaching-learning. Therefore, opening university teacher positions is a national priority for the Didactics of Mathematics and other disciplines.

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