



Pole for Doctoral Studies
Center for Doctoral Studies Sciences and Techniques and Medical Sciences

ANNOUNCEMENT OF DOCTORAL THESIS DEFENSE



M. BOUIFDEN Rafik

**Will present their research work with the aim of earning a
Doctorate**

**Doctoral program: Mathematical Sciences, Physics and New
Technologies**

Discipline: Mathematics

Specialty: Didactics of mathematics

**On 16/05/2026 at 10H00 at the Thesis Defense Hall, Faculty of
Sciences of Tetouan, UAE
Under the Theme**

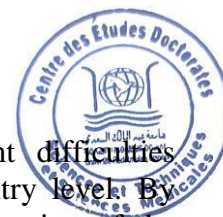
The problem of teaching linear algebra at the undergraduate level

Front of the jury composed of :

First Name & Last Name	Establishment	Designation
Pr. BOUZELMATE Arij	FS of Tetouan, UAE	President
Pr. EZZAIM Laabid	ENS of Marrakech , UCA	Reviewer
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Pr. KHALDI Mohamed	ENS of Tetouan, UAE	Examiner
Pr. LAMARTI SEFIAN Mohamed	ENS of Tetouan, UAE	Examiner
Pr. HADDI Aziz	FS of Tetouan, UAE	Supervisor

Host Research Structure: Analyse fonctionnel non linéaire appliqué au modèles mathématiques (AFNLA)

Abstract



This doctoral thesis provides a systemic analysis of the persistent difficulties surrounding the teaching and learning of linear algebra at the university entry level. By articulating an international comparative perspective with an in-depth investigation of the Moroccan context, the research identifies and examines both the didactic and institutional roots of these difficulties. Its empirical foundation combines the expertise of a university specialist and that of the author, a high school teacher, enabling a continuous analysis of scientific tracks in secondary school (high school) and undergraduate university (SMA).

The study demonstrates that beyond the intrinsic obstacles related to abstraction and formalism, an epistemological and curricular discontinuity structures the problem. The analysis of Moroccan secondary school programs reveals a rich but fragmented conceptual field, insufficiently structured to prepare for abstract thinking. A fundamental rupture is highlighted in the very organization of concepts, notably that of the "vector," between secondary and university approaches, creating a pedagogical gap.

Methodologically, the research relies on a triangulation between a historico-epistemological analysis of concepts, an international literature review, and empirical investigations (analysis of pedagogical guidelines, assessment of student performance). The results highlight the aggravation of difficulties due to gaps in cognitive prerequisites and a significant mismatch between the skills developed in high school and university expectations. This phenomenon crystallizes in the "obstacle of formalism" and a critical threshold termed the "wall of difficulty," observed through students' transition from a stage of hesitant answers to a silence marking abandonment in the face of abstraction.

In response, the thesis synthesizes and moves beyond existing remedial approaches by proposing a strategic framework. This framework aims to ground concepts through interdisciplinary integration, thereby fostering their transferability. It is structured around a "tool-object" approach that teaches linear algebra both as an autonomous theory and as a unifying language. It advocates for a progressive curricular alignment between secondary and university education to introduce abstraction gradually and supports the development of representational fluency among algebraic, geometric, and applicative registers. Finally, it employs historical contextualization to humanize and clarify the genesis of abstract concepts.

In conclusion, this work contributes to the field of mathematics education by formalizing an institutional and didactic analysis model for learning transitions. It argues for a systemic vision that integrates curricular constraints, teaching practices, and cognitive mechanisms. The recommendations, transferable beyond the Moroccan context, aim to make linear algebra a lever for developing critical and adaptive thinking, essential to contemporary scientific challenges.

Keywords: linear algebra; undergraduate level; difficulties of teaching; difficulties of learning; Pedagogical continuity; Moroccan context; Institutional dimension;