

# HABILITATION THESIS

## *Learning Mathematics and Sciences in Current Contexts*

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### SUMMARY

The habilitation thesis entitled "Learning Mathematics and Sciences in Current Contexts" summarizes part of my concerns in the field of "Educational Sciences", especially in the "Didactics of Mathematics and Science". The paper is structured in 6 chapters.

The first chapter presents the evolution of the academic, scientific and professional career. In the activity carried out in university education for over 30 years, I have always had in mind to develop my teaching and research skills, to be an active member of the community of which I belong and to honorably represent the Faculty of Psychology and Sciences of Education and Babeş-Bolyai University in the academic community in Romania and internationally.

The analysis of my activity carried out up to this point gave me the opportunity to reflect on my professional achievements so far, which, in summary, include: coordinator in an international project; coordinator within a national project, expert, member and/or trainer in the teams of 8 national projects; editor-in-chief at ADN journal (indexed in EBSCO, DOAJ, ERIC, ERIH PLUS, PROQUEST); 119 publications for which we accumulated a number of 59 Web of Science (WOS) citations and over 300 Google Scholar (GS) citations excluding self-citations, being quantified with Web of Science h-index = 5, Google Scholar h-index = 13 and Google Scholar i10-index = 17. Regarding my administrative activity, between October 2019 and May 2020 I held the position of Director of the Department of "Didactics of Exact Sciences", and starting from May 2020 and until now I hold the position of Vice-Dean of the Faculty of Psychology and Sciences of Education, being a member of the Faculty Council and coordinator of 2 specialized commissions of the faculty. In 2017, I prepared the accreditation file for the part-time Master's program in "Curriculum Management," which was accredited in 2018, and I am the Program Director.

The second chapter entitled "Research on the curriculum documents for the study of mathematics and science in primary education" analyses to what extent the curriculum for the study of mathematics and science in primary education, ensures the development of mathematics competence. In this chapter, 8 studies that analyze the curricular documents and

issues related to mathematics are presented: school programs, notional contents, textbooks and the opinion of primary education teachers regarding them.

The third chapter, entitled "Research on the integration of knowledge and STEM/STEAM/STREAM activities", addresses a theme considered a priority at the level of the European Union. The 5 studies of the chapter present the theoretical foundations of the issues of integrated teaching in general and respectively of integrated STEM/STEAM/STREAM teaching and two models of didactic approaches: a model of activity based on investigation and STREAM in primary education and a model of STEAM activity for middle school/high school. At the same time, the chapter also contains a study that investigates the relationship between metacognition and STREAM education in science.

In the fourth chapter entitled "Research on the role of ICT in learning mathematics and science" are presented 16 studies. These studies confirm the results of previously published studies highlighting the positive impact of some materials, means and digital platforms such as: animated and educational films, smartboard, Facebook, an educational software and a cognitive tutoring program, in terms of the degree of student involvement, the degree of attractiveness of the lessons and the increase in the school performance of the students. In addition, we identified the problems faced by teachers in the use of these technologies in teaching activities.

In the fifth chapter called "Research on the initial and continuing training for the teaching career" 9 studies are presented regarding the specialty, didactic and digital competences of students and teachers. We found that the students/teachers do not have enough specialized and didactic knowledge and need additional support. Regarding digital knowledge, even if certain tasks were challenging for the students/teachers, they consider them useful in other contexts, they are interested in getting involved in their realization, but they need support in this sense as well.

The last chapter of the thesis entitled "Directions for the development of scientific, academic and professional activity" 7 future directions of research are presented through the foreshadowing of 19 research themes that can constitute possible themes of doctoral theses. At the same time, I highlighted directions for the development of scientific activity, didactic activity and the relationship with the community which I consider important for my further development.

In conclusion, the thesis presents a comprehensive picture of my academic and professional achievements, with an emphasis on mathematics and science teaching. It also details my significant contributions to the field, future research directions and topics.