

Contents

1	State of the Art and Theoretical Framework	1
1.1	Teachers' Professional Competencies	1
1.1.1	The Construct of Professional Competence	1
1.1.2	Initial Models of Teachers' Professional Competencies	2
1.1.3	Advances in the Conceptualization of Mathematics Teachers' Professional Competence	11
1.2	Diagnostic Competence	18
1.2.1	Diagnostic Competence as Accuracy of Judgments	18
1.2.2	Diagnostic Competence as Basis for Adaptive Pedagogical Decisions	22
1.2.3	Relation of Diagnostic Competence with Teachers' Professional Competencies	28
1.2.4	Relevance of Diagnostic Competence for Teaching and for Teacher Education	32
1.2.5	Fostering Diagnostic Competence in Initial Teacher Education	36
1.3	Diagnostic Competence in Error Situations	39
1.3.1	Role of Errors in Mathematics Teaching and Learning	39
1.3.2	Teachers' Diagnostic Competence in Error Situations	47
1.3.3	Model of Teachers' Diagnostic Competence in Error Situations	53
2	Research Question and Hypotheses	69

3 Methodological Approach of the Study	79
3.1 Study Design	79
3.1.1 Description of the University Seminar Sequence	80
3.1.2 Description of the Instruments Used and Test Design	88
3.1.3 Description of the Tasks	92
3.2 Data Collection	99
3.3 Data Analysis	100
3.3.1 Qualitative Data Analysis	100
3.3.2 Quantitative Data Analysis	105
4 Results	139
4.1 Cross-sectional Results	139
4.1.1 Hypothesizing-about-causes Competence	140
4.1.2 Preferences for Dealing with Students' Errors	142
4.1.3 Relationship between Both Competence Components	143
4.1.4 Relationship between Diagnostic Competence and Preservice Teachers' Characteristics	144
4.1.5 Regression Analyses	156
4.1.6 Discussion of Cross-sectional Results	162
4.2 Longitudinal Results	168
4.2.1 Changes in the Hypothesizing-about-causes Competence	168
4.2.2 Changes in the Preferences for Dealing with Students' Errors	169
4.2.3 Relationship between Changes in Both Competence Components	170
4.2.4 Influence of Preservice Teachers' Characteristics on Changes in the Diagnostic Competence	171
4.2.5 Regression Analyses	187
4.2.6 Discussion of Longitudinal Results	192
5 Summary, Discussion and Outlook	199
5.1 Summary and Discussion of Results	200
5.1.1 Cross-sectional Results	201
5.1.2 Longitudinal Results	204
5.2 Limitations of the Study and Further Prospects	206
References	211