Pre-Service Teachers’ Cognitive Learning Processes with regard to Specific Teaching and Learning Components in the Context of Professional Vision – A Mixed-Methods Exploration

Stefanie Schäfer

Vollständiger Abdruck der von der Fakultät TUM School of Education der Technischen Universität München zur Erlangung des akademischen Grades eines Doktors der Philosophie (Dr. phil.) genehmigten Dissertation.

Vorsitzender: Univ.-Prof. Dr. Peter Hubwieser
Prüfer der Dissertation: 1. Univ.-Prof. Dr. Christina Seidel
                        2. Univ.-Prof. Dr. Manfred Prenzel

Die Dissertation wurde am 12.06.2014 bei der Technischen Universität München eingereicht und durch die Fakultät TUM School of Education am 14.07.2014 angenommen.

http://d-nb.info/1056054832
Table of Content

Acknowledgment ...................................................................................................................... 2

Table of Content ..................................................................................................................... 3

List of Tables ............................................................................................................................. 7

List of Figures ............................................................................................................................ 9

Abstract ....................................................................................................................................... 11

1 Introduction ............................................................................................................................. 12

2 Learning, Knowledge and Information Processing .................................................................. 21

2.1 Pre-service teachers' learning as the acquisition of knowledge in the context of information processing ................................................................................................. 21

2.2 Acquisition of complex teacher knowledge ......................................................................... 23

2.2.1 Characterization of teacher knowledge ........................................................................... 24

2.2.2 Characterization of teachers' complex knowledge representations ............................. 27

2.2.3 External representation of pre-service teachers' knowledge ...................................... 37

2.3 Cognitive learning activities during information processing .............................................. 38

2.3.1 Elaboration processes ..................................................................................................... 40

2.3.2 Organization processes .................................................................................................. 41

2.3.3 Assessment of cognitive learning activities .................................................................. 44

3 Knowledge about Teaching and Learning Components as an Integral Part of University-Based Teacher Education ................................................................. 51

3.1 Models about teaching and student learning ....................................................................... 51

3.2 Teaching and learning components .................................................................................... 54

3.2.1 Goal clarity and coherence ............................................................................................. 54

3.2.2 Learning climate ............................................................................................................. 58

3.3 Teaching and learning components in (German) university-based teacher education ... 62

3.3.1 Knowledge acquisition and its support in university-based teacher education .......... 63

3.3.2 Assessment of knowledge acquisition and learning gains ........................................... 70
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.3.3</td>
<td>Assessment of pre-service teachers' learning about specific teaching and learning components in the context of university-based teacher education courses</td>
<td>72</td>
</tr>
<tr>
<td>4</td>
<td>Professional Vision as a Proximal Indicator for Investigating Pre-Service Teachers' Cognitive Learning Processes in the Context of Teaching and Learning Components</td>
<td>76</td>
</tr>
<tr>
<td>4.1</td>
<td>Modell of professional vision</td>
<td>76</td>
</tr>
<tr>
<td>4.2</td>
<td>State-of-the-art measurement approaches in the context of professional vision</td>
<td>82</td>
</tr>
<tr>
<td>4.2.1</td>
<td>Activation of cognitive learning processes</td>
<td>83</td>
</tr>
<tr>
<td>4.2.2</td>
<td>Elicitation of cognitive learning processes</td>
<td>87</td>
</tr>
<tr>
<td>4.2.3</td>
<td>Issues and problems in assessment approaches</td>
<td>94</td>
</tr>
<tr>
<td>4.3</td>
<td>Concept mapping as a new assessment tool in research on professional vision</td>
<td>96</td>
</tr>
<tr>
<td>4.3.1</td>
<td>Classification system and technical qualities of concept maps</td>
<td>96</td>
</tr>
<tr>
<td>4.3.2</td>
<td>Empirical findings on using concept maps in teacher education</td>
<td>102</td>
</tr>
<tr>
<td>5</td>
<td>The present research</td>
<td>107</td>
</tr>
<tr>
<td>6</td>
<td>Study 1: Assessment of pre-service teachers' elaboration processes with regard to specific teaching and learning components in the context of professional vision</td>
<td>110</td>
</tr>
<tr>
<td>6.1</td>
<td>Research questions</td>
<td>112</td>
</tr>
<tr>
<td>6.2</td>
<td>Methods</td>
<td>115</td>
</tr>
<tr>
<td>6.2.1</td>
<td>Research design</td>
<td>115</td>
</tr>
<tr>
<td>6.2.2</td>
<td>Sample</td>
<td>121</td>
</tr>
<tr>
<td>6.2.3</td>
<td>Data analysis</td>
<td>122</td>
</tr>
<tr>
<td>6.3</td>
<td>Results</td>
<td>134</td>
</tr>
<tr>
<td>6.3.1</td>
<td>Pre-service teachers' elaboration processes during noticing</td>
<td>134</td>
</tr>
<tr>
<td>6.3.2</td>
<td>Pre-service teachers' elaboration processes with regard to depth of reasoning</td>
<td>136</td>
</tr>
<tr>
<td>6.3.3</td>
<td>Pre-service teachers' elaboration processes with regard to content of reasoning</td>
<td>138</td>
</tr>
<tr>
<td>6.3.4</td>
<td>Pre-service teachers' elaboration processes in the interplay of noticing and reasoning</td>
<td>140</td>
</tr>
<tr>
<td>6.3.5</td>
<td>Validation of the qualitative analysis</td>
<td>142</td>
</tr>
<tr>
<td>6.4</td>
<td>Discussion</td>
<td>143</td>
</tr>
</tbody>
</table>
# Table of Content

7 Study 2: Investigation of pre-service teachers' organization processes with regard to specific teaching and learning components in the context of professional vision ................................................. 151

7.1. Research questions ........................................................................................................ 154

7.2. Methods .......................................................................................................................... 159

7.2.1 Research design .......................................................................................................... 160

7.2.2 Sample ......................................................................................................................... 161

7.2.3 Data collection ............................................................................................................. 163

7.2.4 Instruments ................................................................................................................. 165

7.2.5 Data analysis ............................................................................................................... 169

7.3 Results ............................................................................................................................ 184

7.3.1 Pre-service teachers' structure-related organization processes ................................ 184

7.3.2 Pre-service teachers' content-related organization processes ............................... 191

7.3.3 Identification of pre-service teachers with different entry levels regarding the integration of higher order principles ............................................................ 198

7.3.4 Group-specific organization processes and changes on the structural level .......... 201

7.3.5 Group-specific organization processes and changes on the content level .......... 207

7.4 Discussion ....................................................................................................................... 213

8 General Discussion ........................................................................................................... 223

8.1 Discussion of central study findings .............................................................................. 223

8.1.1 Nature of pre-service teachers' elaboration processes .......................................... 225

8.1.2 Nature of pre-service teachers' organization processes .......................................... 228

8.1.3 Technical quality of the measurement approach regarding pre-service teachers' elaboration processes ............................................................... 231

8.1.4 Technical quality of the measurement approach regarding pre-service teachers' organization processes ............................................................... 232

8.1.5 Group-specific differences and changes in pre-service teachers' organization processes ............................................................... 234

8.2 Methodology considerations ......................................................................................... 237
8.2.1 Comments on the methodological proceeding to use video for analyzing pre-service teachers' cognitive learning processes ................................................................. 237

8.2.2 Comments on the methodological proceeding to elicit pre-service teachers' elaboration processes ....................................................................................... 239

8.2.3 Comments on the methodological proceeding to elicit pre-service teachers' organization processes ...................................................................................... 241

8.3 Implications ........................................................................................................ 243

8.4 Future research ................................................................................................. 247

References .............................................................................................................. 249