

Teacher-inquirer identity in light of educational innovation and during online master
thesis: Examination of the inquiry skills and other related components

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ABSTRACT

Abstract

The expansion of globalized capitalism accompanied by rapid technological advancements have had profound impact on the educational landscape and vastly increased the challenges that teachers address nowadays. While there is no simple antidote to the complex problems that our world faces, teachers who engage with inquiry can alleviate the practical problems of daily teaching and reach their goals, improve students' learning, and establish possibilities for professional development within their working context. However, despite the inherent potentiality of inquiry for teacher professional growth, the literature on the identity of the teacher-inquirer and related concepts is scarce.

This thesis aims to contribute to the literature regarding the teacher-inquirer identity on several fronts. On a theoretical level, the thesis aims to define the concept of the teacher-inquirer, elaborate a theoretical model of the inquiry skills practiced by teachers when they are conducting an inquiry, and identify other components related to the teacher-inquirer identity. On a practical level, the thesis aims to construct two self-report quantitative questionnaires to measure teachers' inquiry skills and other related components when teachers are engaged in an inquiry in two different settings, examine relationships between the inquiry skills and other components, and categorise clusters of teachers in terms of their inquiry skills.

The thesis recognizes the problems regarding the definition of the teacher identity and begins by reviewing the concept of identity and its characteristics before providing a definition of the teacher identity. Next, it analyses six teacher identity types, explicates how the characteristics of teacher identities are manifested, and examines how the three Modes of Existence can be utilized as a lens to analyse teacher professional identities. Then, based on these foundational concepts as well as on literature on action research and research on social sciences, it constructs a definition of the teacher-inquirer identity, identifies five different

ABSTRACT

phases or skills of inquiry (searching and focusing, understanding and exploring, designing and implementing, evaluating and reflecting, writing and presenting), and discusses how agency, sense-making, ownership, and emotions affect teacher identities.

The research study is situated within the critical realism paradigm. Two online questionnaires were constructed for collecting data from two different populations: in-service teachers who conduct inquiry in light of an educational innovation and student-teachers who conduct a thesis as part of their studies in an online postgraduate course. The two questionnaires gathered 111 and 154 responses respectively.

The statistical analysis revealed that there was considerable overlap between the theoretically identified skills and how participants perceived them in practice. Furthermore, in both studies, teachers reported that they practiced their inquiry skills at least to some extent and several connections among the investigated components emerged. Three different inquirer identity profiles have been identified based on the extent to which teachers and student-teachers practiced their inquiry skills. In general, the three profiles can be ordered from high to low. Lastly, it was found that several components, including sense-making, ownership, agency, and emotions, have an impact on the development of the teacher-inquirer identity in both studies.

The results are considered within the limitations of survey research and several suggestions for future research are made. Finally, a series of implications for practice are set forth that can be beneficial for a wide audience; from teachers and school leaders to educational policy designers and scholars.

ABSTRACT

Resumen

La expansión global del capitalismo, acompañada de los rápidos avances tecnológicos, ha tenido un impacto profundo en el panorama educativo y aumentó enormemente los desafíos a los que se enfrentan los docentes en la actualidad.

Si bien no hay un antídoto sencillo para la complejidad de los problemas que nuestro mundo afronta, los docentes que se involucran con la investigación pueden aliviar los problemas prácticos de la enseñanza diaria y alcanzar sus metas, mejorar el aprendizaje de los estudiantes y tener más posibilidades para desarrollarse profesionalmente dentro de su contexto laboral. Sin embargo, a pesar de la potencialidad inherente de la investigación para el crecimiento profesional de los docentes, la literatura sobre la identidad del docente investigador y conceptos relacionados es escasa.

Esta tesis pretende contribuir a la literatura sobre la identidad del docente investigador en diferentes aspectos. A nivel teórico, la tesis tiene como objetivo definir el concepto de docente-investigador, elaborar un modelo teórico de las habilidades de investigación que los docentes ponen en práctica cuando dirigen una investigación, e identificar otros componentes relacionados con la identidad del docente-investigador. A nivel práctico, la tesis tiene como objetivos elaborar dos cuestionarios cuantitativos de autoinforme para medir las habilidades investigadoras de los docentes y otros componentes relacionados cuando los docentes están implicados en una investigación en dos entornos diferentes, explorar las relaciones entre las habilidades investigadoras y otros componentes, y categorizar en grupos de profesores (clusters) en función de sus habilidades investigadoras.

La tesis reconoce los problemas relacionados con la definición de la identidad del docente y empieza revisando el concepto de identidad y sus características antes de dar una definición de la identidad del docente. A continuación, analiza seis tipos de identidad de los

ABSTRACT

docentes, y explica cómo se manifiestan las características, y revisa cómo los tres Modos de Existencia pueden utilizarse como lentes para analizar las identidades profesionales de los docentes. Luego, basándose en estos conceptos fundamentales así como en la literatura sobre investigación-acción e investigación en ciencias sociales, se elabora una definición de identidad del docente-investigador, se identifican cinco fases o habilidades de investigación diferentes (buscar y decidir el foco, comprender y analizar, diseñar e implementar, evaluar y reflexionar, escribir y presentar), y analiza cómo la agencia, la búsqueda de sentido, las emociones y el sentimiento de propiedad afectan a las identidades del docente.

El estudio de investigación se enmarca dentro del paradigma del realismo crítico. Se elaboraron dos cuestionarios online para recoger datos de dos poblaciones diferentes: docentes en activo que realizan una investigación sobre una innovación educativa y estudiantes-docentes que realizan una tesis como parte de sus estudios en un Postgrado online. Los dos cuestionarios recopilaron 111 y 154 respuestas respectivamente.

El análisis estadístico reveló que había una superposición considerable entre las habilidades identificadas en la teoría y cómo los participantes las percibían en la práctica. Además, en ambos estudios, los docentes informaron que ellos practicaron sus habilidades investigadoras al menos hasta cierto punto y surgieron varias conexiones entre los componentes investigados. Se han identificado tres perfiles de identidad de investigador diferentes en función del grado en que los docentes y los estudiantes-docentes practicaron sus habilidades investigadoras. En general, los tres perfiles pueden ordenarse de mayor a menor. Por último, se encontró que varios componentes, incluyendo la búsqueda de sentido, el sentimiento de propiedad, la agencia y las emociones, tienen un impacto en el desarrollo de la identidad del docente-investigador en ambos estudios.

ABSTRACT

Se analizan los resultados teniendo en cuenta las limitaciones de la investigación con cuestionarios y se hacen varias sugerencias para futuras investigaciones. Finalmente, se plantean una serie de implicaciones para la práctica que pueden ser beneficiosas para una amplia audiencia; desde docentes y líderes escolares hasta diseñadores de políticas de educativas y académicos.

ABSTRACT

Resum

L'expansió global del capitalisme, acompanyada dels ràpids avanços tecnològics, ha tingut un impacte profund en el panorama educatiu i va augmentar enormement els desafiaments als quals s'enfronten els docents en l'actualitat.

Si bé no hi ha un antídote senzill per a la complexitat dels problemes que el nostre món afronta, els docents que s'involucren amb la recerca poden alleujar els problemes pràctics de l'ensenyament diari i aconseguir les seves metes, millorar l'aprenentatge dels estudiants i tenir més possibilitats per a desenvolupar-se professionalment dins del seu context laboral. No obstant això, malgrat la potencialitat inherent de la recerca per al creixement professional dels docents, la literatura sobre la identitat del docent investigador i conceptes relacionats és escassa.

Aquesta tesi pretén contribuir a la literatura sobre la identitat del docent investigador en diferents aspectes. A nivell teòric, la tesi té com a objectiu definir el concepte de docent-investigador, elaborar un model teòric de les habilitats de recerca que els docents posen en pràctica quan dirigeixen una recerca, i identificar altres components relacionats amb la identitat del docent-investigador.

A nivell pràctic, la tesi té com a objectius elaborar dos qüestionaris quantitius d'autoinforme per a mesurar les habilitats investigadores dels docents i altres components relacionats quan els docents estan implicats en una recerca en dos entorns diferents, explorar les relacions entre les habilitats investigadores i altres components, i categoritzar en grups de professors (clústers) en funció de les seves habilitats investigadores.

La tesi reconeix els problemes relacionats amb la definició de la identitat del docent i comença revisant el concepte d'identitat i les seves característiques abans de donar una definició de la identitat del docent. A continuació, analitza sis tipus d'identitat dels docents, i

ABSTRACT

explica com es manifesten les característiques (en cada tipus) , i revisa com les tres Maneres d'Existència poden utilitzar-se com a lents per a analitzar les identitats professionals dels docents.

Després, basant-se en aquests conceptes fonamentals així com en la literatura sobre recerca-acció i recerca en ciències socials, s'elabora una definició d'identitat del docent-investigador, s'identifiquen cinc fases o habilitats de recerca diferents (buscar i decidir el focus, comprendre i analitzar, dissenyar i implementar, avaluar i reflexionar, escriure i presentar), i analitza com l'agència, la cerca de sentit, les emocions i el sentiment de propietat afecten les identitats del docent.

L'estudi de recerca s'emmarca dins del paradigma del realisme crític. Es van elaborar dos qüestionaris en línia per a recollir dades de dues poblacions diferents: docents en actiu que realitzen una recerca sobre una innovació educativa i estudiants-docents que realitzen una tesi com a part dels seus estudis en un Postgrau en línia. Els dos qüestionaris van recopilar 111 i 154 respostes respectivament.

L'anàlisi estadística va revelar que hi havia una superposició considerable entre les habilitats identificades en la teoria i com els participants les percebien en la pràctica. A més, en tots dos estudis, els docents van informar que ells van practicar els seus habilitats investigadores almenys fins a un cert punt i van sorgir diverses connexions entre els components investigats. S'han identificat tres perfils d'identitat d'investigador diferents en funció del grau en què els docents i els estudiants-docents van practicar les seves habilitats investigadores. En general, els tres perfils poden ordenar-se de major a menor. Finalment, es va trobar que diversos components, incloent la cerca de sentit, el sentiment de propietat, l'agència i les emocions, tenen un impacte en el desenvolupament de la identitat del docent-investigador en tots dos estudis.

ABSTRACT

S'analitzen els resultats tenint en compte les limitacions de la recerca amb qüestionaris i es fan diversos suggeriments per a futures recerques. Finalment, es plantegen una sèrie d'implicacions per a la pràctica que poden ser beneficioses per a una àmplia audiència; des de docents i líders escolars fins a dissenyadors de polítiques d'educatives i acadèmics.

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CONTENTS

Contents

Abstract.....	2
Resumen.....	4
Resum	7
Acknowledgements.....	10
Contents	12
Index of Figures	16
Index of Tables	17
1. Introduction.....	21
1.1. Background.....	21
1.2. Justification of the Study	23
1.3. Research Aims and Questions	23
1.4. Context of the Study	28
1.5. Thesis Organisation	28
2. Identity	30
2.1. Introduction.....	30
2.2. Problems with the Definition of Identity	31
2.3. Why is Needed a Historical Review of Self and Identity	32
2.4. Early Conceptualizations of Self and Identity	32
2.5. Conceptualizations of Self and Identity in Renaissance	34
2.6. Modern Conceptualizations of Self and Identity	35
2.7. Post-Modern Conceptualizations of Self and Identity	40

CONTENTS

2.8. Definition of Identity	48
2.9. Synopsis	49
3. Teacher Identity	52
3.1. Introduction.....	52
3.2. Traditional Conceptualisations of Teacher Identity.....	53
3.3. Problems in Defining Teacher Identity.....	55
3.4. How Teacher Identity is Defined in this Thesis.....	57
3.5. Types of Teacher Identities.....	58
3.6. Characteristics of Teacher Identities.....	65
3.7. Using the MoE for Interpreting Teacher Identities.....	72
3.8. Synopsis	78
4. Teacher-Inquirer Identity	82
4.1. Introduction.....	82
4.2. Definition of the Teacher as Inquirer.....	83
4.3. Skills of the Teacher-Inquirer	84
4.4. Agency, Sense-making, Ownership, and Emotions.....	101
4.5. Synopsis	110
5. Research Methodology	115
5.1. Introduction.....	115
5.2. Research Design.....	115
5.3. PCA.....	120

CONTENTS

5.4. Data Analysis	122
5.5. Synopsis	124
6. First Study: Teachers' Perspectives Regarding Inquiry.....	126
6.1. Introduction.....	126
6.2. Data Collection	126
6.3. Teachers' Sample.....	126
6.4. Questionnaire on Teachers' Perspectives Regarding Inquiry.....	130
6.5. PCA.....	132
6.6. Findings.....	139
6.7 Synopsis	176
7. Second Study: Student-teachers' Perspectives Regarding Inquiry.....	181
7.1. Introduction.....	181
7.2. Data Collection	181
7.3. Student-teachers' Sample.....	181
7.4. Questionnaire on Student-teachers' Perspectives Regarding Inquiry.....	186
7.5. PCA.....	188
7.6. Findings.....	200
7.7. Synopsis	247
8. Conclusions.....	252
8.1 Introduction.....	252
8.2. Identified Inquiry Skills of the Teacher-inquirer Identity.....	253

CONTENTS

8.3. Relationships Among the Teacher-inquirer Identity Components	253
8.4. Differences Between the Teacher-inquirer Identity Profiles	260
8.5. Identified Inquiry Skills of the Student-teacher as Inquirer Identity	263
8.6. Relationships Among the Student-teacher as Inquirer Identity Components	263
8.7. Differences Between the Student-teacher as Inquirer Identity Profiles	269
8.8. Limitations	272
8.9. Implications for Practice	273
8.10. Future Research	275
References	277
Appendix A	313
Publications	313
Appendix B	313
Survey on Teachers' Perspectives Regarding Inquiry (English version)	313
Appendix C	321
Survey on Student-teachers' Perspectives Regarding Inquiry (English version)	321

Index of Figures

Figure 1: Clustered bar chart displaying the means for the cluster solution of the teachers across the inquiry skills.....170

Figure 2: Clustered bar chart displaying the means for the cluster solution of the student-teachers across the inquiry skills.....240

CONTENTS

Index of Tables

Table 1: Teachers' gender and age	127
Table 2: Teachers' English language level	128
Table 3: Teachers' profession and working experience	128
Table 4: Means and standard deviations of teachers' information literacy skills.....	139
Table 5: Means and standard deviations of teachers' participation in professional development opportunities.....	141
Table 6: Means and standard deviations of the extent to which teachers practiced their inquiry skills in light of the educational innovation.....	144
Table 7: Means, standard deviations, and correlations between the variables of information literacy skills, English language skills, and inquiry skills	147
Table 8: Squared correlation coefficients between the variables of information literacy skills, English language skills, and inquiry skills.....	148
Table 9: Means, standard deviations, and correlations between the variables of ownership, sense-making, agency, and inquiry skills	149
Table 10: Squared correlation coefficients between the variables of ownership, sense-making, agency, and inquiry skills.	150
Table 11: Means, standard deviations, and correlations between the variables of being, doing, having, and inquiry skills	153
Table 12: Squared correlation coefficients between the variables of being, doing, having, and inquiry skills.....	153
Table 13: Means, standard deviations, and correlations between the variables of information literacy skills, English language skills, and teachers' perceptions of being, doing, and having	159

CONTENTS

Table 14: Means, standard deviations, and correlations between the variables of being, doing, having, ownership, sense-making, and agency	160
Table 15: Squared correlation coefficients between the variables of being, doing, having, ownership, sense-making, and agency	160
Table 16: Differences between the three clusters of teachers in inquiry skills.....	169
Table 17: Differences between the three clusters of teachers in information literacy and English language skills.	171
Table 18: Differences between the three clusters of teachers in ownership, sense-making, and agency.	172
Table 19: Differences between the three clusters of teachers in perceptions of being, doing, and having.....	174
Table 20: Student-teachers' gender and age	182
Table 21: Student-teachers' education demographics	182
Table 22: Student-teachers' English language level.....	183
Table 23: Student-teachers' profession and working experience	184
Table 24: Student-teachers' postgraduate studies and experience in conducting inquiry activities	185
Table 25: Means and standard deviations of student-teachers' information literacy, research, and professional skills.....	202
Table 26: Means and standard deviations of the extent to which student-teachers practiced their inquiry skills during their thesis.	205
Table 27: Means and standard deviations of the extent to which student-teachers increased their knowledge on different dimensions.....	209
Table 28: Means and standard deviations of the extent to which student-teachers perceived that other people helped them.....	210

CONTENTS

Table 29: Means, standard deviations, and correlations between the variables of information literacy skills, research skills, professional skills, English language skills, experience in conducting thesis, and inquiry skills	212
Table 30: Squared correlation coefficients between the variables of information literacy skills, research skills, professional skills, English language skills, experience in conducting thesis, and inquiry skills.....	213
Table 31: Means, standard deviations, and correlations between the variables of ownership, sense-making, agency, participants' engagement, and inquiry skills	216
Table 32: Squared correlation coefficients between the variables of ownership, sense-making, agency, participants' engagement, and inquiry skills.	216
Table 33: Means, standard deviations, and correlations between the variables of emotions and inquiry skills	220
Table 34: Squared correlation coefficients between the variables of emotions and inquiry skills.....	220
Table 35: Means, standard deviations, and correlations between the variables of support and inquiry skills	222
Table 36: Squared correlation coefficients between the variables of support and inquiry skills.	223
Table 37: Means, standard deviations, and correlations between the variables of knowledge and inquiry skills	224
Table 38: Squared correlation coefficients between the variables of knowledge and inquiry skills.....	224
Table 39: Means, standard deviations, and correlations between the variables of information literacy skills, research skills, professional skills, English language skills, experience in conducting thesis, and knowledge increase	227

CONTENTS

Table 40: Means, standard deviations, and correlations between the variables of ownership, sense-making, agency, participants' engagement, and knowledge increase	229
Table 41: Squared correlation coefficients between the variables of ownership, sense-making, agency, participants' engagement, and knowledge increase.	229
Table 42: Means, standard deviations, and correlations between the variables of emotions and knowledge increase	233
Table 43: Squared correlation coefficients between the variables of emotions and knowledge increase.	233
Table 44: Means, standard deviations, and correlations between the variables of support and knowledge increase	235
Table 45: Squared correlation coefficients between the variables of support and knowledge increase.	235
Table 46: Differences between the three clusters of student-teachers in inquiry skills.	239
Table 47: Differences between the three clusters of student-teachers in information literacy, research, professional, English language skills and experience in conducting thesis.	241
Table 48: Differences between the three clusters of student-teachers in ownership, sense-making, agency, and participants' engagement.	242
Table 49: Differences between the three clusters of student-teachers in emotions.	244
Table 50: Differences between the three clusters of student-teachers in their perceptions about the support they received.	245
Table 51: Differences between the three clusters of student-teachers in perceptions regarding knowledge increase.	246

1. Introduction

1.1. Background

The expansion of globalized capitalism accompanied by rapid technological advancements have had a profound impact on the ethos and culture of today's societies (Amin, 2014). Over the last decades radical and swift changes have been witnessed in all aspects of life; from how people learn and work to how they socialize with others and get entertained.

In these times of flux and uncertainties, the development of inquiry attitudes and skills is becoming more important than ever. The traditional ideal of retiring after working in the same job for decades has long been obsolete (Bureau of Labor Statistics, 2019) as workers need to be able to explore opportunities and frequently adapt and update their skills. The recent COVID-19 pandemic has revealed striking problems in how people are getting informed and in how they evaluate information credibility (Wikipedia, 2020), which again marks the importance of an inquiring mind.

Unquestionably, the role of education is crucial in this era. Conventional educational models that have as sacrosanct knowledge acquisition and memorization cannot effectively prepare students for the unpredictable challenges of the future. Instead, students should be encouraged in having an active role and should be supported in developing knowledge and skills that will empower them to become the drivers of their own learning.

Without disregarding or downgrading the importance of other stakeholders (i.e. government, society, parents, students, etc.), teachers are key to educational quality and reform. Unarguably, educational policies and social climate regulate the educational process and content (T. M. Brown, 2012; Callahan et al., 2020; Woolhouse & Cochrane, 2015), yet,

ultimately, teachers are the ones who interpret and implement the policies and the curricula at the classroom level.

At the same time, however, a teacher's work is becoming more challenging than ever. The growing capitalist crisis and extending inequality in how education funds are spent caused sharp cuts in school budgets and crisis-driven educational policies and reforms (ETUCE, 2013, 2014; Smith, 2014; Williams, 2016), which led to school merges and closures, increased class sizes and working hours for teachers, and severely reduced additional educational programmes and instructional supports (Baker et al., 2020; Jackson et al., 2018). More and more children live in a state of poverty, experience growing stress in their families due to the austerity measures, and often arrive at school hungry or without the necessary equipment, which deteriorates their performance and distracts them from the lesson (Beaulieu, 2014; Smith, 2014).

In this challenging educational landscape teachers arrive with inferior skills and training, and, what is worse, they are being offered few opportunities for professional development during their teaching career. Teacher's salary and working conditions does not tempt the best students to choose the teaching profession (European Commission et al., 2019; Rivkin & Hanushek, 2007). On the other hand, nearly one out of two students who choose the teaching profession exit over the first five years of the entry (Gallant & Riley, 2014) due to burnout (Beltman et al., 2011), bad working conditions (Lim & Eo, 2014; Struyven & Vanthournout, 2014), and poor initial teacher education (Zeichner, 2014). To make things worse, teachers are offered a narrow range of opportunities for professional development, especially early in their careers when they need it most (Opfer & Pedder, 2010), while several factors obstruct teachers to partake effectively in continuous professional development opportunities (Geldenuys & Oosthuizen, 2015).

While there is no simple antidote to the ills of globalized capitalism and the complex, interconnected problems that our world faces, teachers who engage with inquiry can alleviate the practical problems of daily teaching and reach their goals, improve students' learning and the quality of the learning opportunities offered to them, and establish possibilities for professional development within their working context (Giralt-Romeu et al., 2020; Myers, 2016).

1.2. Justification of the Study

Despite the inherent potentiality of inquiry for teacher professional growth and educational success, the literature on the identity of the teacher-inquirer and related concepts is scarce. The few existing studies examine the characteristics of teachers' inquiry-based attitude (M.-J. Meijer et al., 2016), how student-teachers perceive inquiry and its relation to their professional identity (Giralt-Romeu et al., 2020), how the school context and the ways conducting research shape teacher identities (Myers, 2016), how narratives help teachers to construct teacher-inquirer identities (L. A. Taylor, 2017), and how the identity of the teacher as inquirer can be conceptualized through dialogical self theory (Badia et al., 2020).

More research on the teacher-inquirer identity would benefit the design and development of professional development courses aiming at nurturing and promoting inquiry attitudes and competencies to teachers (Badia et al., 2020).

1.3. Research Aims and Questions

1.3.1. Research Aims

The research aims of the thesis are twofold, theoretical and practical.

On a theoretical level, the thesis has three aims. First, to define the concept of the teacher-inquirer identity based on literature related to conducting an inquiry and on the concept of the teacher identity. Second, to review the literature in order to elaborate a

theoretical model of the inquiry skills practiced by teachers when they are conducting an inquiry. Third, to identify other components related to the teacher-inquirer identity.

On a practical level, the thesis has three aims as well. First, based on the identified inquiry skills and the other identity components, to construct two self-report quantitative questionnaires that measure teachers' inquiry skills and other related constructs when teachers are engaged in an inquiry in two different settings: in light of an educational innovation and during an online master thesis. Second, to examine whether and to what extent inquiry skills are related to other identity components. Third, to categorise clusters of teachers in terms of their inquiry skills and examine the differences among the different clusters.

1.3.2. Research Questions

Based on the research aims a series of research questions were formulated which are listed below. Each research question is broken down to a number of sub-questions.

1. What are teachers' perceptions regarding their skills, their participation in professional development opportunities, and the extent to which they have practiced inquiry skills in light of the educational innovation?
 - What are the information literacy skills that teachers perceive they have?
 - To what extent teachers participated in professional development?
 - To what extent teachers perceive that they have practiced their inquiry skills?
2. To what extent practicing of inquiring skills is related to other relevant skills, perceptions of ownership, sense-making, and agency, and teachers' perceptions of being, doing, and having?
 - To what extent information literacy and English language skills are related to the inquiry skills that teachers practice in light of an educational innovation?

- to what extent perceptions of ownership, sense-making, and agency are related to the inquiry skills that teachers practice in light of an educational innovation?
 - to what extent perceptions of being, doing, and having are related to the inquiry skills that teachers practice in light of an educational innovation?
3. To what extent teachers' perceptions of being, doing, and having, in light of educational innovation, are related to relevant skills and perceptions of ownership, sense-making, and agency?
- To what extent information literacy and English language skills are related to teachers' perceptions of being, doing, and having in light of an educational innovation?
 - To what extent teachers' perceptions of being, doing, and having in light of an educational innovation are related to their perceptions of ownership, sense-making, and agency?
4. What are the differences among clusters of teachers when considering components of the teacher-inquirer identity?
- What are the different teacher profiles based on their inquiring skills?
 - What are the differences among clusters of teachers when considering information literacy and English language skills?
 - What are the differences among clusters of teachers when considering their perceptions of ownership, sense-making, and agency?
 - What are the differences among clusters of teachers when considering their perceptions of being, doing, and having?
5. What are student-teachers' perceptions regarding their skills, the extent to which they have practiced inquiry skills and increased knowledge during their thesis, and the extent to which other people participated in the development of their thesis?

- What are the information literacy, research, and professional skills that student-teachers perceive they have?
 - To what extent student-teachers perceive that they have practiced their inquiry skills during their thesis?
 - To what extent student-teachers perceive that they have increased their knowledge during their thesis?
 - To what extent student-teachers perceive that other people participated in the development of their thesis?
6. To what degree practicing of inquiring skills during the thesis is related to previous experience in conducting a thesis, other relevant skills, emotions, perceptions of ownership, sense-making, and agency, knowledge increase, and involvement of other people?
- To what extent information literacy, research, professional, English language skills and experience in conducting thesis are related to the inquiry skills that student-teachers practice during their thesis?
 - To what extent perceptions of ownership, sense-making, agency, and participants' engagement are related to the inquiry skills that student-teachers practice during their thesis?
 - To what extent are emotions related to the inquiry skills that student-teachers practice during their thesis?
 - To what extent are perceptions regarding support received from the university and the supervisor are related to the inquiry skills that student-teachers practice during their thesis?
 - To what extent are perceptions regarding knowledge increased related to the inquiry skills that student-teachers practice during their thesis?

7. To what extent knowledge increase during the thesis is related to previous experience in conducting a thesis, other relevant skills, emotions, perceptions of ownership, sense-making, and agency, and involvement of other people?
 - To what extent information literacy, research, professional, English language skills and experience in conducting thesis are related to student-teachers' knowledge increase during their thesis?
 - To what extent perceptions of ownership, sense-making, agency, and participants' engagement are related to student-teachers' knowledge increase during their thesis?
 - To what extent are emotions related to student-teachers' knowledge increase during their thesis?
 - To what extent are perceptions regarding support received from the university and the supervisor are related to student-teachers' knowledge increase during their thesis?

8. What are the differences among clusters of student-teachers when considering components of the student-teacher identity as an inquirer?
 - What are the different student-teacher profiles based on their inquiring skills?
 - What are the differences among clusters of student-teachers when considering information literacy, research, professional, English language skills and experience in conducting thesis?
 - What are the differences among clusters of student-teachers when considering ownership, sense-making, agency, and participants' engagement?
 - What are the differences among clusters of student-teachers when considering emotions experienced during the thesis?

- What are the differences among clusters of student-teachers when considering their perceptions regarding the support received from the university and the supervisor during the thesis?
- What are the differences among clusters of student-teachers when considering perceptions regarding knowledge increase during the thesis?

1.4. Context of the Study

In order to address the overarching aims and answer the research questions of the thesis, two different contexts were selected as the research focus of this thesis. The first is related to the inquirer identity that teachers develop when they are engaged with an educational innovation in their own classroom settings. The second is related to the inquirer identity that student-teachers develop when they are conducting a master thesis.

1.5. Thesis Organisation

The thesis is organised into 9 chapters. An outline of each chapter is provided below.

Chapter 1 (this chapter) introduces the reader to the research, justifies the need of the research in the area of teacher-inquirer identity, provides the research aims and questions, and summarises the chapters.

Chapter 2 reports the problems in conceptualizing identity as well as in distinguishing it from the self and, after reviewing how self and identity have been conceptualized throughout history, it defines identity based on the literature and analyses the post-modern characteristics of identity.

Chapter 3 starts by considering teacher identity conceptualisations throughout history and the problems in defining teacher identity and then it moves to a definition of teacher

identity, an analysis of six types of teacher identities, and an explication of how Modes of Existence can be used for interpreting teacher identities.

Chapter 4 provides a definition of the teacher-inquirer, constructs a theoretical model of the skills that are developed during an inquiry, and examines four components of the teacher-inquirer identity (agency, sense-making, ownership, and emotions) affect teacher identities when teachers are engaged in professional development.

Chapter 5 discusses issues related to the research methodology of the thesis starting with a discussion of the overall research design, next it moves to a description of the PCA procedure and criteria, and, finally, it explicates the data analysis procedure.

Chapters 6 and 7 are concerned with the research design, the PCA, and the findings of the first and second study accordingly in light of the related literature.

Chapter 8 concludes the thesis by summarizing the major findings, discussing the theoretical contributions of the study, considering the research limitations, suggesting potential avenues for future research and pedagogical implications for teacher professional development.

2. Identity

2.1. Introduction

In this chapter the principal concept used in this thesis, identity, is defined and its characteristics are analysed, while the concept of self is also discussed. The reason that this section deals with both identity and self will become clearer as the discussion unfolds, but for now suffice it to say that it is nearly impossible to study identity without referring to the concept of self.

The concept of identity, though appeared in the literature only about a century ago, has been receiving increasing attention across the social sciences the last few decades. Before its emergence, other terms, mostly 'self' and 'self-concept', were used to discuss aspects of the 'I' and 'me'. While the concept of identity is recent, self is not; philosophical discussions of the self are traced to Plato's book 'Ethics' (circa 400 B.C.E.) (Leary & Tangney, 2012). It should be noted here that this thesis examines the concepts of self and identity as they have been developed in the western world.

Although it might have been expected that a term so vigorously studied would have been sufficiently defined by our times, paradoxically, not only a widespread definition is lacking, there is no consensus and shared understanding among scholars in the field of what identity *is*, while the concepts of self and identity are often used interchangeably. As it will be revealed in section 2.1, this incoherence resulted in a variety of approaches for studying identity issues and produced diverse identity theories regarding identity formation (Côté, 2006).

2.1.1. Chapter Structure

The next section recognizes the chronic problems in the definition of identity and its differentiation from self. In section 2.3. it is explained why a historical review of the concepts

of self and identity is needed for a more holistic understanding of how identity evolved into the current meanings. The historical review begins from ancient times (2.4.), next examines how self and identity were conceptualized in Renaissance (2.5.), and, lastly, analyses how self was conceptualized as well as how identity formation was investigated for the first time in modern times (2.6.). Section 2.7 begins by discussing the effect of the post-modern context on the self and the characteristics of the post-modern self, next analyses the differences among the metatheoretical assumptions in researching identity in post-modernity, and, following that, the characteristics of identity in post-modern times are explained. The penultimate section (2.8.) offers a definition of identity and self that clearly separate the two constructs and form the cornerstone of this thesis. Lastly, section 2.9. draws a synopsis of the themes discussed.

2.2. Problems with the Definition of Identity

Although identity is a commonly used concept and everyone has a rough idea of its gist, when it comes to defining its precise meaning and its difference with self the path that lies ahead is muddy and slippery. The reasons for this are multifold and interconnected.

First, as it will be explicated in the next section, self (mainly) and identity (to a lesser extent) have derived profoundly different interpretations throughout history majorly influenced by the sociopolitical and cultural environment. Second, due to their close relatedness and indeed resemblance, they are widely considered as synonyms and they are frequently used interchangeably even in academic studies. Third, over the last century identity has been studied from a sociological and a psychological perspective with limited cross-reference and collaboration between the two disciplines resulting in distinctively different levels of analysis, approaches, and frameworks, partial and fragmented conceptualisations, and unrelated outcomes (Côté & Levine, 2002). Fourth, self is used as a unifying construct for an array of diffuse constructs, such as self-awareness, self-concept,

self-confidence, self-esteem, self-evaluation, ego, identity, and so on, yet research on these topics is fragmented in the sense that a coherent theoretical foundation has not yet emerged (Côté & Levine, 2002), while it often remains unstated and obscure whether these constructs are properties of the self (i.e. whether self is an aggregation of these constructs) or whether these constructs are only superficially related to the ‘true’ self (i.e. one’s self-confidence does not significantly alter one’s self). Fifth, the terms self and identity are used to signify and communicate disparate topics in both everyday and academic writing, such as person, personality, ego, character, soul, and so on (Leary & Tangney, 2012). Sixth, although they are widely used, and perhaps because of that, scholars often only vaguely define self and identity, as if they are plainly understood, while, ironically, it is difficult to find precise definitions of self and identity in the literature (Côté & Levine, 2002; Stets & Serpe, 2013).

2.3. Why is Needed a Historical Review of Self and Identity

The review of the concepts of self and identity throughout the ages is fundamental for the definition of identity for two reasons. On the one hand, it builds our understanding of the varied meanings that these two concepts have acquired and how they evolved into the current meanings and, most importantly, the meanings of the concept of identity presented in this thesis. On the other hand, it acknowledges that many of these outdated conceptualizations survive and, in some cases prevail, in the academia as well as in people’s minds and behaviors until today (Oyserman et al., 2012).

2.4. Early Conceptualizations of Self and Identity

For most of humankind history the self was considered as having a fixed and stable inner core that was little affected by context or biography. In traditional societies myths or religions projected “images of cosmic order onto the plane of human experience” and, conversely but correspondingly, “human actions [were tuned] to an envisaged cosmic order” (Geertz, 1973, p. 90). Hence, for instance, the ancient aphorism ‘know thyself’ was often

interpreted as a divine advice or warning; that is, one should be mindful of his/her place in the cosmos and avoid behaviors that defy or challenge the established norms. Individuals who were heedless of their place and violated the natural order with their actions were committing 'hubris' and were punished by the Gods. In this way of thinking the individual was subordinated to the greater cosmic whole and had to live his/her life according to collective norms.

The role of ethics and religion was to assist the individual move from a state of "mere living" to "a higher, better kind of life" by realizing one's "proper telos or end in the cosmos" (Richardson et al., 1998, p. 498). In this sense, life was a quest for improvement of the self. Hence, moral fiber and integrity were highly esteemed and people were deeply committed in their relationships, friendships, and life purposes (Gergen, 1991). It was believed that actions reflected one's underlying character and as such, everyone was directly accountable for the consequences of one's actions (Gergen, 1991).

In traditional societies the formation of an identity "was by all accounts a relatively straightforward process" as people "simply assumed and fitted into the culturally prescribed roles" (Côté & Levine, 2002, p. 1) that their ancestors had themselves adopted. Not only adopting these 'culturally prescribed roles' was inevitable due to the limited resources and experiences that most people had, but also individuals who did not wish or were not able to adapt themselves to the prescribed roles were sanctioned in some way or they were facing the risk of banishment from their community (Côté & Levine, 2002). Even those in positions of wealth, authority, and power who might have had more opportunities and choices to develop their identity beyond the established roles, were still restricted by the sociopolitical customs as well as the narrow range of roles available in rudimentary societies (Côté & Levine, 2002). Overall, in traditional societies identity formation was not an issue of personal choice and negotiation.

2.5. Conceptualizations of Self and Identity in Renaissance

Although the traditional conceptions about the self have been dominant for centuries, their theoretical foundations have been critically examined by Greek philosophers more than a century before the first writings about the self. Hence, the existence of gods was questioned which had immediate implications to morality, the construction of collective norms and laws, and the purpose of the individual in life (Drozdek, 2005; Schiappa, 2003). In addition, the idea that things are in a state of constant change and because of this change they are staying the same in essence was set forth (Graham, 2020), which provokes the idea of a constant and fixed self and set the foundations of the concept of becoming (Christidis, 2012). Lastly, rather than resorting to religion, authorities, and societal structures for finding one's purpose in the life, self-inquiry was suggested as the highest form of human activity that one can and should undertake in order to acquire 'knowledge of thyself' (Rappe, 1995).

The scientific revolutions and the revived interest in ancient Greek philosophers in Renaissance challenged the ideas that governed societies for centuries and a radically new conception of the self was elaborated. Prominent philosophers and scientists of the time attempted to find a scientific explanation for every phenomenon instead of blindly accepting arbitrary truths and explanations based on religious traditions. Accordingly, the sense of a self subordinated to a meaningful cosmic order was replaced by an individualistic, sovereign self that is firmly rooted to itself, ideally disengaged, free and rational, distinguished from both the natural and social worlds (C. Taylor, 1995). Famous in this respect is the statement 'cogito, ergo sum' (I think, therefore I am) by Descartes, which stresses how one can find his/her origin and justification within himself/herself. The genesis of the sovereign self was an influential milestone in the conceptualization of the self and a crucial break with the past (Hall, 1992).

Another significant development on the conceptualization of the self was that people ceased to equate one's actions with one's self. A distinction was drawn between the inner and the outer self and it was perceived that the inner self was the 'real' self, yet it was hidden, whereas the outer self was easier for others to know and observe (Baumeister, 1987). Even so, there was still a conception of a self with a fixed inner core that remained more or less the same throughout one's existence (Hall, 1992).

The radical change from collective to individualistic notions of self had a major impact on how identity was formed in Renaissance and afterwards. First and foremost, one's identity was no longer utterly determined by the social rank and profession of his/her family (Baumeister, 1987). Instead of just accepting preassigned societal roles, people were free to choose their own path. Thus, children were no longer tied to a moral duty to continue the profession of their ancestors and, what is more important, their individuality was recognized even within the constraints of their social class and profession. In sharp contrast to how identities were formed in the past, identity formation became a rather open matter in that epoch.

2.6. Modern Conceptualizations of Self and Identity

In the beginnings of the 20th century prominent philosophers questioned the dominant conception of the unitary self with a fixed inner core (Cooley, 1902; James, 1892; Mead, 1934). For the first time in history, it was argued that the self, though more or less stable, it changes over time, it is presented in a different way and perceived by others differently depending on the social context, and it exists beyond the boundaries of one's physical body including actions, objects, people, and even abstract concepts, such as fame, that one is connected with. Cooley described how self is developed over time:

[The feeling of self] seems to exist in a vague though vigorous form at the birth of each individual, and... to be defined and developed by experience... Meantime the feeling itself does not remain unaltered, but undergoes differentiation and refinement... Thus, while retaining under every phase its characteristic tone or flavor, it breaks up into innumerable self-sentiments. (1902, p. 171)

From another viewpoint, James asserted that the present and past self are “the same in *kind*” (1892, p. 202; emphasis in the original) as there is continuity between the two and alterations are gradual and never affect the whole self at once.

Before this period, the self was conceived not only fixed and unchanged, but also confined within a physical body or mind. In sharp contrast to the dominant views of his epoch, James (1892) posited that whatever one call *mine*, it is part of his/her *Me*. This includes people (e.g. family, friends), animals (i.e. pets), objects and property (i.e. books, house, land), works (an artifact that one is working on or has produced), and even abstract concepts (i.e. reputation). He advanced this idea by suggesting that even people, places, and things that one cannot call his/hers, yet he/she know them well, enlarge his/her “[s]elf in a sort of metaphoric social way” (James, 1892, p. 185).

It was further acknowledged that the self is developed within a social context and that opinions of others have a crucial influence on the construction of self. Mead expresses this view as:

The self is something which has a development; it is not initially there, at birth, but arises in the process of social experience and activity, that is, develops in the given individual as a result of his relations to that process as a whole and to other individuals within that process. (1934, p. 1)

The importance of others in the formation of self is illustrated in Cooley's metaphor of the "reflected or looking-glass self" (1902, p. 184) through which one can see how his/her self is perceived by others. In the same vein, yet from another point of view, James stressed that one "*has as many social selves as there are individuals who recognize him*" (1892, p. 179; emphasis in the original) and thus shows a different side of self to different categories of people. Hence, for instance, people present a different self to their children and to their colleagues at work. This idea was further progressed by Mead who suggested that the self could take on different approaches to different social circumstances depending on the role played by the individual:

We carry on a whole series of different relationships to different people. We are one thing to one man and another thing to another... We divide ourselves up in all sorts of different selves with reference to our acquaintances. We discuss politics with one and religion with another. There are all sorts of different selves answering to all sorts of different social reactions. (1934, p. 4)

At the same time, the formation of self is viewed as part of a reflexive, learning process by which attitudes, behavior, values, and roles are accrued over time. What is more, Mead (1934) suggested that there is a form of internal dialogue between the self and the individual, which mediates one's conversations with others and everyday actions.

In parallel with the developments on the conceptualization of the self in modern times, identity issues began to be studied and discussed. The popularity of the concept grew in the clinical analysis field as it was observed that many young people were severely conflicted and had troubles in establishing a sense of personal identity, a phenomenon which was dubbed 'identity crisis' by the pioneer developmental psychologist Erikson (1968, p. 17).

Erikson's work on identity development was ground-breaking and laid the basic theoretical foundations for studying identity, while it is still relevant today (Côté & Levine, 2002).

According to Erikson's developmental theory (1968) one's identity as a person develops from infancy to adulthood in a predetermined order through stages. When moving from one stage to the succeeding individuals may experience a crisis due to the radical change in perspective. What is called crisis by Erikson is actually "a turning point, a crucial period of increased vulnerability and heightened potential" during a person's growth and awareness development (1968, p. 96). Depending on how the crisis is resolved, it could have positive and/or negative outcomes for one's identity formation and, for good or for worse, an irrefutable impact on one's identity as a person. In very crude terms, it could be inferred that successful resolution of each stage and its accompanying crisis results in a healthy identity as a person. Once a sense of personal identity is established, one is able to maintain a sense of sameness of the self over time and address effectively the vicissitudes and tensions of the social life.

This sense of sameness or continuity is crucial for the individual in three different dimensions. First, as already mentioned, continuity of one's personal identity; second, continuity of interrelationships with others; and, third, continuity of membership and participation in particular communities or groups. Hence, when a type of discontinuity emerges in one's relationships with others (i.e. due to a change in the working/living context), then one's social identities may lose their stability. At those periods a strong sense of identity as a person help the individual to surmount the challenges and regain stability in the relationships with others (i.e. by making new friends). Similarly, when the relations within a community are continuous and stable, then the social identities of its members are sustained, whereas when a discontinuity emerges in these relations, then members' social

identities are threatened. In such cases, one's personal identity affects the ways that his/her social identities related to the group will be revised.

It was also found that people demonstrate different styles in the formation of their identity as a person. Elaborating on Erikson's theory, Marcia (1966) postulated and validated four different identity statuses depending on the extent of conscious choice-making and commitment to various domains of values and functioning. It was theorized that the four statuses form a continuum from the least mature and least complex to the most mature and complex status.

From another perspective, identity issues were studied by sociologists as a way to understand individuals as situated in social interaction and embedded within society (Côté & Levine, 2002; Stets & Serpe, 2013). Depending on the school of thought, different research approaches were employed to study identity issues and, what is more relevant to the discussion here, different perspectives were held regarding identity characteristics and formation (Côté & Levine, 2002; Stets & Serpe, 2013). Hence, nominalists perceived that identities are precarious and are modified through the daily interactions and the meanings that people attach to things (Côté & Levine, 2002). According to this view, due to the emergent nature of identities in social interactions, there is need of continual management (Goffman, 1956). Realists, on the other hand, held that there is a core self and identities are relatively fixed and stable (Kuhn, 1964; Kuhn & McPartland, 1954). From this sociological strand, a theory of an adaptive identity strategy emerged which postulated that individuals have the capacity and flexibility to modify and control self-concepts as well as to experience different identity components in varying social contexts as the situation demands (Zurcher, 1977). Within the realists, it was also studied whether identities are a product of the societal structure and the institutional setting wherein one acts or whether it is something that is attained, created or achieved (Turner, 1976) as well as which roles an individual will enact

based on prominence hierarchies and situational demands (McCall & Simmons, 1978). In general, it was found that the more one uses the available resources to verify his/her identities, the more committed to his/her identities becomes and vice versa (Stets & Serpe, 2013).

2.7. Post-Modern Conceptualizations of Self and Identity

2.7.1. The Post-modern Context

Large scale socioeconomic changes as well as major technological advances the last decades had extensive impact on several aspects of individual and social life. The post-modern world is rife with images of injustice, poverty, war, and death which create feelings of disorientation to the individual and make challenging to find who he/she is and how he/she fits into this world (Schachter, 2005). While the capitalist society nurtures economic inequality alongside inequality under the law, it is compelled to conceal and suppress basic contradictions in wealth disturbance and social justice in order to blur where one's interests lie and ultimately alienate the self (Dunne, 1995). Alienation and decentering of the self is further supported by the rise of institutions (schools, hospitals, barracks, etc.) that discipline populations and produce 'docile citizens' (Hall, 1992). The self is becoming alienated by the absence of a community for although there are more opportunities for interaction and establishing relationships in today's world, individualization is promoted and superficial and temporary relationships are multiplied (Schachter, 2005). Add to that, extreme changes in the work nature and environment (i.e. division of labor, impersonal producer-customer relationship, diminished social responsibility and business ethics, emphasis on extrinsic rather than intrinsic motivation, etc.) made challenging to find self-fulfillment at work (Baumeister, 1987). Moreover, the increased complexity of the globalized society accompanied with ambiguity over meaning and decisions and complete lack of control of future developments, creates an atmosphere of uncertainty which impedes the establishment of a rigid self

(Hermans & Hermans-Konopka, 2010). Establishment of a rigid self has been becoming more difficult also due to the decline in faith in science and knowledge as well as to the increasing failure and abandonment of religious faith (Baumeister, 1987; Gergen, 1991; Hermans & Hermans-Konopka, 2010). The mixing of cultures as a result of globalization led to the split of the culturally unified self and to the emergence of hybrid selves (Featherstone et al., 1995; Hermans & Hermans-Konopka, 2010; Hermans & Kempen, 1998; Marotta, 2008). Social movements that have mushroomed since the mid-20th century (feminism, LGBTQ, ecology, anti-fascist, black, workers, peace, etc.) questioned established norms of social and governmental organization and opened up to political contestation social roles and relationships resulting to a decentering of the self (Hall, 1992). What is more, rapid social and technological change as well as increased participation in multiple contexts (virtual as well) and groups have created difficulty in perceiving continuity and sameness in one's self (Schachter, 2005).

In parallel to the aforementioned contextual changes in the postmodern era, a series of ruptures in social theory and human sciences radically altered how the self was conceptualized (Dunne, 1995; Hall, 1992). First, a new interpretation of Marx's writings, which posits that individuals could not be true agents of their history for they could only act on the conditions formed by the previous generations, displaced any notion of individual agency (Dunne, 1995; Hall, 1992). Second, Freud's theory that one's self and identities are formed in the unconscious and the self is always divided and split, regardless that the individual experiences his/her own self as unified, deconstructed the notion of the rational individual with a fixed and unified entity (Dunne, 1995; Hall, 1992). Third, for the first time the role of language as a social system with specified rules and cultural bearings was recognized in the construction of the self (Dunne, 1995; Hall, 1992; Richardson et al., 1998). Thus, not only language pre-exists us and as such an individual cannot be the absolute

‘author’ of his/her statements, but also the meanings of words are not fixed and always bear echoes of other meanings.

The aforementioned changes resulted to a drastic alienation, dislocation, deconstruction, and decentering of the self. While the ‘sovereign’ self presented “a picture of a stable centre incorrigibly present to itself and negotiating with its surrounding world from within its own securely established powers of knowing and willing”, the post-modern self presents an almost reverse picture where the context “engulfs, if not annihilates, the self” (Dunne, 1995, pp. 139–140).

2.7.2. The Post-modern Self

Putting the modern self into question opened the way for “restoring a sense of the cultural embeddedness of human life and opening the door to values and possibilities submerged or marginalized by the outlook of self-contained individualism” (Richardson et al., 1998, p. 513). Many postmodern views of the self attempt to protect human freedoms from dogmatism and domination, yet at the same time, they often succumb to the viewpoints they wish to dethrone while they present models of self that do not convincingly explain fundamental issues regarding one’s moral aims (Richardson et al., 1998).

In attempting to find an alternative to the ‘sovereign’ and ‘decentered’ self, some thinkers have discussed the idea of a ‘storied’ (Dunne, 1995) or a ‘dialogical’ self (Hermans et al., 1992). In order to make sense of the notion of the ‘self’, a narrative seems to be necessary since we make sense of ourselves through the story we can tell about our moments and our lives (Dunne, 1995). Narrative inquiry attracted researchers’ interest as it is increasingly employed for conducting empirical research on aspects of the self and identity (e.g., Kearns, 2012; L. A. Taylor, 2017). The dialogical self theory, on the other hand, perceives human understanding and existence as having a fundamentally dialogical character

(Hermans et al., 1992). Building on the conception of the self as ‘narrator’ as well as on James’s distinction of the self as a subject (*I*) and an object (*Me*) (James, 1892), the self is conceptualized as a mind space where several relatively autonomous voices have a dialogical relationship (Hermans et al., 1992). Hence, rather than conceiving the self as “a center of monological consciousness” (Richardson et al., 1998, p. 509), it is perceived as a place of constant dialogue among the various voices of the self. Likewise, whereas the ‘sovereign’ self is separated from others and culture, the dialogical self incorporate others’ and collective voices and as such it is “culture-inclusive” (Hermans, 2001, p. 243) and ethically sensitive (Richardson et al., 1998). Like narrative inquiry, the dialogical self theory is increasingly employed as a theoretical framework in empirical studies that aim to understand and examine aspects of the self and identity (Akkerman & Meijer, 2011; Badia et al., 2020).

2.7.3. Differences in Researching Identity in Post-modern Times

Identity studies have exponentially increased since the mid-19th century marking the growing importance of the concept in post-modern societies (Côté, 2006). Undoubtedly, this rapidly elevating interest reveals that the identity formation has been becoming more and more challenging for the individual in the post-modern era. Although post-modern identity theories are founded, to a lesser or greater extent, on Erikson’s writings on identity development and its operationalization by Marcia (1966), there is much diversity in the way identity issues are conceptualized and studied in terms of the metatheoretical assumptions adopted (Côté, 2006) and the level of analysis (Côté & Levine, 2002). In the paragraphs that follow, first the differences among the metatheoretical assumptions in researching identity are briefly described and next the three levels of analysis and their interrelations are briefly explained.

To begin with, the first dimension of difference is concerned with the deep-rooted epistemological division regarding the nature of reality (Côté, 2006). On the one extreme it is

theorized that social reality is fixed, exists independently of human consciousness, and it can be reliably observed, whereas on the other extreme it is theorized that social reality is dependent on the consciousness of the individual and as such there is no objective or universally accepted reality. Subsequently, in the former it is believed that identity manifestations are both reliably observable and measurable, whereas in the latter the focus is on capturing the qualities of identities as experienced and/or interpreted by the individuals.

The second dimension of difference is concerned with assumptions held towards the social order (Côté, 2006). On the one hand, social order is considered inevitable and it is taken for granted, while it is perceived that it has little detrimental effect on identity development. In this notion identity development is a universal process that is only minimally affected by social structures. On the other hand, the status quo is viewed critically and identity development processes as highly contextual. As such no one identity form, identity development process or context is postulated to be optimal.

The third dimension of difference is concerned with the level of analysis in researching identity (Côté, 2006; Côté & Levine, 2002). On the first level, personality, the focus is on personality characteristics, internal mental processes, and topics related to the self. The second level, interaction, deals with behavior patterns that characterize daily interactions among people. On the third level, social structural, the emphasis is on understanding persistent patterns of social organization and convention, embodied in roles and statuses. These social structures affect interactional processes among people as well as the identity formation process of the person. Similarly, through exposure to interactional processes one internalizes social roles and statuses while at the same time produces presentations of his/her self.

2.7.4. Identity Characteristics in Post-Modern Times

In post-modernist views identity is conceptualized as being created, relational, multiplistic, decentered, dynamic, context specific, fluid, and occasionally fragmented. Each of these identity characteristics are briefly analyzed in the following paragraphs.

Identity formation is viewed as a process of creation rather than of discovery (Waterman, 1984). Although notions of ‘discovering’ one’s identity and self are rather popular nowadays as individuals continually try to grasp a better understanding of their selves and find their ‘core’ or ‘true’ self, the notion of a core self suggests that there is only a limited range of possible identities that one can acquire. On the contrary, identity formation ‘entails making choices from among an almost limitless array of alternatives and becoming what one has chosen to become’ (Waterman, 1984, p. 334).

The relational character of identity signifies that identities are not self-contained but they acquire meaning in relation to difference (Rattansi & Phoenix, 2005). That is any particular identity that one may has, for instance teacher, expert, adaptable, only acquires meaning in relation to what it is not, for instance student, amateur, inadaptable (although other identities can be considered as opposites as well). Subsequently, one’s identities develop and operate in relation to other identities that one has.

By suggesting multiple identities, the notion of a unified identity that manifests as coherent, continuous, and the same across contexts is eschewed (Rattansi & Phoenix, 2005). Different identities are evoked in different contexts, for instance teacher at school, colleague in professional meetings, parent at home, and so on. The different identities that one has can cooperate and support each other or can even be contradictory (Hermans & Hermans-Konopka, 2010); for instance, one’s identity as a teacher can collaborate or contradict with his/her identity as a parent.

Identity is decentered as a result of its relational and multiplistic character (Rattansi & Phoenix, 2005). Therefore, any single identity cannot completely occupy the centre of one's self but only temporarily can acquire a position close to the centre for at any moment other identities come into play, while when the situation changes it is displaced and decentered by other identities (Hermans & Hermans-Konopka, 2010). However, the more important one identity is to an individual, the greatest centrality it has (Stets & Serpe, 2013).

Identities are dynamic, in the sense that they are becoming more central or more peripheral depending on the context (Hermans & Hermans-Konopka, 2010; Rattansi & Phoenix, 2005). Hence, for example, one's teacher identity becomes more central at school rather at home. Additionally, during the teaching process other identities might come into play, such as those of the parent and the student as well as identities related to personality characteristics, i.e. patient and impatient identities, while other identities not quite related to the context, i.e. vegetarian, traveler, are decentered.

From the discussion thus far it is made clear that identities are context specific as different contexts evoke different identities (Hermans & Hermans-Konopka, 2010; Rattansi & Phoenix, 2005). The context has different impact to different people, as for instance, the school does not evoke the same identities to the teachers and the students. This apply also to individuals who have the same role within a particular context, that is, the school evokes different identities to different teachers. In general, the more salient one identity is, the more probable is that this identity will be invoked across contexts (Stets & Serpe, 2013).

Additionally, the context affects the identity formation process in the form of the resources that presents to the individual (Côté & Levine, 2002). Hence, for instance, a school with state-of-the-art equipment presents different identity development opportunities to both its teachers and students to a school with very few or outdated equipment (Russell et al., 2003). The same applies to the relationships with people in a particular context as well as the culture

of the context. Hence, for example, a cohort of meticulous students evokes the development of different identities to a teacher compared to a cohort of lazy students. Similarly, a culture of collaboration among colleagues within the school will affect in different ways the identities of a teacher compared to an antagonistic school culture.

Rather than being fixed, identities are fluid and develop according to the situation and over time (Rattansi & Phoenix, 2005). When an identity is activated in a situation, an unconscious and relatively automatic identity control process starts that guides the individual in performing that identity as well as in comparing the performance with the way he/she sees himself/herself as having the given identity (Stets & Serpe, 2013). Depending on feedback from the environment, the individual may feel that his/her identity is verified (positive emotions) or may feel that there is a non-correspondence between his/her internalized identity and the way others perceive him/her (negative emotions), in which case he/she will work in order to resolve the discrepancy (Stets & Serpe, 2013). Although identities are never fully and finally established (Hall, 1992; Rattansi & Phoenix, 2005), the more frequent an individual holds a specific identity or the harder the individual works to verify that identity, the more salient that identity becomes (Stets & Serpe, 2013).

Lastly, identities can be at times fragmented as a result of the coexistence of radically different or contradictory identities within one's self (Hermans, 2003). Far from perceiving identities as closed and entirely determined by institutional, social, and cultural structures, identities are always open and always in the process of formation (Rattansi & Phoenix, 2005). Hence, there is not a single trajectory for the formation of i.e. the father identity or the teacher identity, while individuals have to negotiate on every occasion the ways they will experience and perform their identities. However, institutional, social, and cultural structures do establish a set of norms for the various roles and impose identities on the individual. Therefore, on the one hand the individual exercise agency in performing his/her identities and on the other hand

experiences the power of imposed identities on him/her. When there is radical contradiction among the imposed and performed or aspired identities the individual may experience his/her identities as fragmented.

2.8. Definition of Identity

Recently, a few prominent scholars in the field of self and identity suggested a definition of the self that is quite close to the way James (1892) described what it means to have a self and views identities as part of one's self-concepts (Leary & Tangney, 2012; Oyserman et al., 2012).

In the core of this definition, it is suggested that “[s]elf, self-concept, and identity can be considered as nested elements, with aspects of the ‘me’-forming self-concepts and identities being part of self-concepts” (Oyserman et al., 2012, p. 74). According to this approach, self is viewed as a mental capacity that allows one to think consciously and develop self-images and self-feelings about herself/himself (Leary & Tangney, 2012; Oyserman et al., 2012). In other words, people feel that they know themselves, since they have a personal experience of their self from childhood supplemented by a huge amount of autobiographical memories (Reese, 2009). They feel that there is a continuity and coherence in their self, while the discontinuities, crises, and shifts signal the grow and evolution of their self (Rodgers & Scott, 2008). Thus, far from being simply an array of shifting identities, the self is the meaning-maker of one's identities.

On the other hand, identities “include content and readiness to act and employ mindsets to make meaning” (Oyserman et al., 2012, p. 94). To put it simply, identities include the personal traits and characteristics as well as one's social relations, roles, and memberships (Oyserman et al., 2012). These elements are “orienting” and “they provide a meaning-making lens” which eventually determine one's focus on features of the immediate

context and his/her subsequent actions (Oyserman et al., 2012, p. 69). For instance, one can have a vegetarian identity that contains relevant goals, values, thoughts, feelings, and behaviors regarding being vegetarian. Besides identities of the present, one's identities can also belong to the past (one's former identities) or the future (i.e. one's aspiring identities) (Oyserman et al., 2012). Lastly, as identities are "formed through unconscious processes over time", it makes more sense to see identities not "as a finished thing", but rather "as an ongoing process" and thus "speak of *identification*" (Hall, 1992, p. 287; emphasis in the original). In simple terms, though it is common and fairly logical to discuss identity topics and issues as if an individual's identity is more or less stable and does not change significantly within a short time period and within familiar for the individual contexts, we should always bear in mind that one's identity is constantly and inevitably in a process of formation and development.

2.9. Synopsis

Any attempt to discuss and define the concept of identity without considering the concept of self will eventually be proven unworkable for self and identity are inextricably connected throughout the history. Although interest to the concept of self dates back two and a half millennia, it is still debated today what exactly self is and, more importantly for this thesis, how it is differentiated from identity.

Self and identity are not only individual, but also social constructs and as such they are influenced by the epoch and society in which they are formed (i.e. the self in ancient times is not the same as the self in post-modern times, neither identity formation), while outdated conceptualizations survive in our culture until today. Hence, a historical review of the concepts is necessary in order to acquire a more holistic understanding of the evolution of identity to today's meanings.

In short, in traditional societies the self was considered as having a fixed and stable inner core subordinated to a divine plan, while one's identity was largely determined by inherited characteristics or attributes like race, sex, and family's social status. While this conception reigned for most of human history it was eventually dethroned by the 'sovereign self' which was endowed with the capacity to reason and was liberated from myths and shibboleths. Accordingly, identity formation became more a matter of individual choice and accomplishment based on one's efforts, skills, and achievements rather dependent of inherited statuses.

In modern times the conception of the unitary self with a fixed inner core was questioned, yet the self was divided into two worlds: the inside (more or less fixed) and the outside (multiple). Strategically managing identities in social encounters in order to fit was considered important, while identity development was seen as a linear process that occurs in stages from infancy to adulthood.

Large scale socioeconomic changes, major technological advances, and a series of ruptures in socio-human sciences in the post-modern era radically altered how the self was conceptualized and resulted to a drastic alienation, dislocation, deconstruction, and decentering of the self. The interest of the academic community on identity has exponentially increased as, undoubtedly, identity formation became a rather challenging process for the individual in the post-modern society. Research on identity formation is largely based on theories from the modern age, yet there is much diversity in the way identity issues are conceptualized and studied in terms of the metatheoretical assumptions adopted and the level of analysis. In the post-modern era identity is conceptualized as being created (rather than discovered), relational (acquires meaning in relation to difference to other identities), multiplistic (instead of coherent and continuous), decentered (any single identity cannot completely occupy the centre of the self), dynamic (identities are becoming more central or

more peripheral depending on the context), context specific (different contexts evoke different identities), fluid (develops according to the situation and over time), and occasionally fragmented (when radically contradictory identities coexist within one's self).

After reviewing how conceptions about identity and self have evolved throughout the history and how identity is conceptualized nowadays a definition of identity is provided that acknowledges the complexities of the post-modern context, attempts to reconcile social and psychological perceptions of identity, and clearly distinguishes identity from self. In this definition identities are viewed as mental constructs that include the personal traits and characteristics as well as one's social relations, roles, and memberships, while self is viewed as a mental capacity. A metaphor that illustrates the connection between the two concepts as well as the significance of each one has been provided by Rodgers and Scott: "the self can be seen as the... teller of stories. If our identities are stories, then our selves might be the storytellers" (2008, p. 738).

3. Teacher Identity

3.1. Introduction

If we bring to mind the problems with the understandings and definitions of self and identity in psychology and social sciences it comes to no surprise that the concept of teacher identity in the literature suffers from similar problems of ill-definition. This chapter builds on the previous discussion on identity to construct a definition for teacher identity that will be used as a theoretical foundation for this thesis.

Based on the definition and drawing from the literature, it identifies six different types of teacher identities (subject matter expert, didactical expert, pedagogical expert, professional, learner, political being) and discusses their components. Add to that, it examines how these teacher identities can manifest the identity characteristics (i.e. constructed, relational, multiplistic, etc.) which were recognized in the previous chapter (section 2.7.4.). Finally, the chapter reviews the theory of Modes of Existence (MoE) and examines how it can be used for interpreting teacher identities.

3.1.1. Chapter Structure

The chapter begins with a brief historical review of how teacher identity was conceptualized from ancient till modern times and how teacher identity emerged as an important concept in the last half century. Next, in section 3.2, it is considered why defining teacher identity is hardly a straightforward task and the most salient problems are examined. Building on the definition of identity from Chapter 2, a definition of teacher identity is provided in section 3.3. Following that, six types of teacher identities are presented and briefly analysed in section 3.4. The different types of teacher identities enable a discussion in section 3.5 about how identity characteristics are manifested. The penultimate section examines how MoE can be utilized for interpreting teacher identities and, lastly, section 3.7 provides a synopsis of the topics discussed in the chapter.

3.2. Traditional Conceptualisations of Teacher Identity

3.2.1. Early Conceptualisations of Teacher Identity

For most of human history a teacher was considered someone who had a high degree of knowledge in a subject and who was transmitting this knowledge to his/her students. In this conceptualization the *process* of teaching is knowledge transmission while the student is the only responsible for achieving learning. The metaphor of the teacher as a pitcher which pours its content into the empty cups that are the students dates back to ancient Greece (Nails, 2020). As regards the *methods* and *principles* of teaching, what is currently broadly defined as pedagogics or pedagogy, it is interesting to note that these terms are derived from the ancient Greek word ‘παιδαγωγός’ (pedagogue), which signified in the antiquity a trusted slave, not necessarily educated, charged to conduct the children to and from school, safeguard them, ensure children’s application to their studies, and discipline them when needed (Masségliia, 2015).

Hence, in this conceptualization the teacher does not have to be concerned with the methods of teaching not even with students’ learning. It is assumed that children will learn by listening to and memorizing the teacher’s lectures, while no extra effort from the part of the teacher is required with reference to the methods of teaching.

In this early conceptualization an individual is a teacher by virtue of his knowledge on a subject. Mastering knowledge is the necessary and sufficient requirement for teaching. It is not surprising, thus, that terms originating from the Latin word ‘magister’ (master) are used in several languages (e.g. Catalan: mestre, Spanish: maestro, etc.) to describe the teacher. What has come later to be identified as teaching methods (pedagogy), was not considered to be part of a teacher’s responsibility, rather, for many centuries at least, it was responsibility of another person of markedly lower status compared to the status of the teacher.

3.2.2. Modern Conceptualisations of Teacher Identity

With the rise of mass schooling the need for teachers that would be able to fill the empty classrooms exponentially increased, but due to the absence of a formal teacher education system and teacher qualification, the hiring criteria were set very low (Labaree, 2008). It is indicative that a good moral character and being local were considered perhaps more important than knowledge of the subject or teaching skills (Angus, 2001; Labaree, 2008). As a result, the conceptualization of the teacher as an expert gradually faded away, while teaching was largely perceived as a technically simple process that included for the most part curriculum delivery and classroom management (Hargreaves, 2000).

The emergence of the first formal teacher education systems, though marked the professionalization of the teacher and provided some formal training to prospective teachers, the training offered was of low academic quality in the vast majority of teacher education schools, due to the increased social demands for teachers and the power of tradition regarding the teaching procedure (Hargreaves, 2000; Labaree, 2008). It makes sense, therefore, that the teacher identity was not put into question not even within formal teacher education.

Early research into the teaching profession viewed teachers' role from a very narrow angle and of limited scope. In the 1960s, studies viewed teachers as "shadowy figures on the educational landscape" that they only had to "mechanistically and unproblematically" respond to the expectations of the teaching role (Ball & Goodson, 1985, p. 6). During late 60s and early 70s, research viewed, chiefly negatively, teachers as a cog in the educational machine that processed the students (Ball & Goodson, 1985). In the late 70s the wave was reversed for the better for the teachers as research focused on the socioeconomic constraints within teachers' work and viewed teachers as victims of the capitalistic structures (Ball & Goodson, 1985).

3.2.3. The Emergence of Teacher Identity as an Important Concept

Although the early and modern conceptualisations of the teaching profession have not contributed to the later works on teacher identity, the studies conducted in the late 70s have brought to the surface the complexities of the teaching process and opened up the way for “a more productive and dialectical conception of teachers’ work” (Ball & Goodson, 1985, p. 7).

As it is aforementioned, the interest to the concept of teacher was limited to non-existent until the 1970s, yet since then studies in the field increased exponentially (Akkerman & Meijer, 2011; Avalos, 2016) and in the 1990s teacher professional identity emerged as a separate research area (Beijaard et al., 2004).

This growing interest goes hand in hand with a move away from the modern conceptualization of teacher identity as monolithic and of teaching as a relatively simple and purely mechanistic process. Early post-modern studies recognized not only that teaching is far from merely curriculum delivery but that it is also inextricably linked to teachers’ personal lives and the surrounding context (Connell, 1985; Hargreaves, 1994; Nias, 1987). Hence, the research focus shifted from solely examining teachers’ work inside the classroom to include teachers’ personal biographies, the social relationships, and the socio-political structures that surround them and investigate how these were influencing teaching in the classroom and their teacher identity.

3.3. Problems in Defining Teacher Identity

Since teacher identity was an uncharted territory, scholars and practitioners in the education field turned to the fields of psychology and social sciences to understand the meaning of identity. Nevertheless, as it is documented in chapter 2, not only there is an absence of a widespread definition of identity, but there is still disagreement regarding the difference and precise meaning of self and identity, while lacking a shared understanding of

what identity exactly *is*. Unsurprisingly, thus, the concept of teacher identity suffers from problems that at least to some extent are rooted to the definition problems of the fore-concepts of self and identity. The following paragraphs discuss in more detail the most intricate and persistent problems that plague the area of teacher identity.

First of all, the relationship between the teacher self and teacher identity remains unclear, while usually little or no effort is made to be explicated in the empirical studies (Beijaard et al., 2004). In the first literature review of academic research on the area of teacher professional identity, it was found that the two concepts were often used interchangeably, although it appeared that they were different (Beijaard et al., 2004). What is more, in discussing the teacher's self, some of the studies seemed to look at it from a modernist point of view (i.e. a teacher's self is one's authentic core as a teacher), while others from a postmodernist point of view (i.e. a teacher's self is related to how teachers understand their experiences, while it may differ in time and may be dependent by the context) (Beijaard et al., 2004). As the way the teacher self is perceived determines how the teacher identity is defined, a lack of a clear explanation of the teacher self leads to problems in the definition and understanding of the teacher identity.

Second, teacher identity lacks a widespread and clear definition. In their review Beijaard et al. (2004) found that the concept of teacher identity was defined in very different ways or not defined at all. Thus, not only nearly half of the studies reviewed did not offer an explicit definition of teacher identity, but what is more troublesome, perhaps, is that the concept of teacher identity acquired very different meanings while different aspects of it were highlighted too. Hence, in some studies teacher identity was related to teachers' concepts or images of their self, in other to teachers' roles and the relationship of these roles with other concepts such as reflection, self-evaluation, and the like, and in other studies to both what teachers find important to do and to the influence of the expectations of the society. It is also

interesting to note that the greatest variety in the definition of teacher identity was observed in the studies that focused specifically on teachers' characteristics of professional identity. The variety was so extensive that Beijaard et al. (2004) concluded that it was impossible to draw any specific conclusions from these studies as regards to which characteristics particularly shape teachers' identity. Another interesting point is that even though a subsequent literature review on the area recognized the absence of a clear definition (Izadinia, 2012), it eschewed the issue altogether, while the most recent literature review reported that "only few authors clearly state the definition they have adopted in their research" (Rodrigues & Mogarro, 2019, p. 3).

Lastly, the problem with the definition of teacher identity development gets more complicated by the report of changes in teacher identity as manifestations of teacher identity itself (Izadinia, 2012). In part this is due to the dynamic character of teacher identity and its conception as "an ongoing process" rather as "stable or fixed" (Beijaard et al., 2004, p. 122), yet, when the terms 'teacher identity' and 'teacher identity development' are used to denote the same concept or process not only the line between teacher identity and teacher identity development is blurred, questions are also raised as regards the substance of the term 'teacher identity development' as well as the validity of terms that imply a sort of identity achievement or stability, such as "teacher identity establishment" (Huang et al., 2019, p. 1), "developing an identity as a teacher" (Hammerness et al., 2005, p. 383), and the like.

3.4. How Teacher Identity is Defined in this Thesis

The thesis draws on the definition of identity (see section 2.8) to define the teacher identity. Hence, building on the definition by Oyserman et al. that identities "include content and readiness to act and employ mindsets to make meaning" (2012, p. 94), *the teacher identity includes the personal traits and characteristics as well as a teacher's social relations, roles, and memberships that are activated during the teaching process (i.e. in the*

classroom) as well as during out-of-school activities related to the teaching process and the teacher's professional life in general. The elements of the teacher identity determine a teacher's motivations, beliefs, knowledge, skills, and behaviors on topics related to teaching, learning, and the teaching profession while direct the teacher's focus on features of the immediate professional context and his/her subsequent actions. Besides identities of the present, a teacher's identities can also belong to the past (former teacher identities) (Sutherland et al., 2010) or the future (i.e. imagined or feared teacher identities) (Choi et al., 2016; S. Lee & Schallert, 2016; Miller & Shifflet, 2016; Xu, 2013). Lastly, rather than completed or finished, teacher identities are developed through ongoing, iterative, most often unconscious, processes over time and as such it makes more sense to speak of the process of *becoming a teacher* rather than of the outcome of *being a teacher*.

3.5. Types of Teacher Identities

In the last couple of decades several teacher educators and researchers have proposed models, frameworks, and instruments that intend to conceptualise or describe the essential components of the teacher identity.

Drawing on the literature regarding elements and processes that comprise the teacher identity (Beijaard, 1995; Karaolis & Philippou, 2019; Korthagen, 2004; Stenberg et al., 2014), six interrelated and interdependent teacher identities have been identified: teacher as subject matter expert, teacher as didactical expert/learning facilitator, teacher as pedagogical expert, teacher as learner, teacher as professional, and teacher as political being. Each of these sub-identities include several components, such as underlying motivation, related knowledge, skills, beliefs, behaviors, roles, and relationships with other people. Add to that, teacher identities manifest identity characteristics as these have being identified in section 2.7.4.

In the following paragraphs the six types of teacher identities are analysed, and, after that, in section 3.6., it is explicated how the characteristics of the teacher identities are manifested.

3.5.1. Teacher as Subject Matter Expert

As it is documented in this chapter, in most of human history the teacher was conceptualized as expert of the subject matter. Undoubtedly, expertise in the subject matter is an important element of a teacher (Woolhouse & Cochrane, 2015), even though lately teacher knowledge in the subject matter was disregarded in relevant research (Beijaard et al., 2000). However, besides knowledge and competencies related to the subject matter, this identity includes a teacher's beliefs about the subject matter (e.g., which historical account is closer to the truth, what content should be taught in schools, etc.) (Abednia, 2012; Stenberg et al., 2014) as well as beliefs about his/her level of knowledge and competencies (e.g. self-efficacy, self-esteem) (Karaolis & Philippou, 2019; Virta, 2015; Xu, 2013).

Additionally, by being experts in the subject matter, teachers may demonstrate behaviors related to the practice of the discipline (e.g., music teacher: singing, art teacher: painting, science teacher: scientist, etc.) (Helms, 1998; Kenny et al., 2015; Timoštšuk & Ugaste, 2010), form relationships or memberships (e.g. member of a music band, member of scientists association, etc.) and adopt roles related to their expertise.

3.5.2. Teacher as Didactical Expert

The recognition of teaching as a far more complicated process than a straightforward transmission of knowledge, elevated methods of instruction to an important part of a teacher's role. Hence, it is considered important that teachers build their understanding of theoretical topics related to instruction, make connections with their practical experience, and

develop their reflective skills (Bullough et al., 2008; Choi et al., 2016; Hsieh, 2016; Sutherland et al., 2010).

The teacher as didactical expert finds motivation in working with students and helping them learn (Fokkens-Bruinsma & Canrinus, 2014; Thomson & Palermo, 2014). Underlying motivation has a significant impact on shaping the practices of the teachers (Ertmer et al., 2012; Korthagen, 2004; Paulick et al., 2013), while teachers' beliefs and practices establish the relationship with their students.

Teachers' knowledge of teaching procedures (Loughran et al., 2012) can be considered a source for their beliefs about teaching and learning as well as their practices (Girvan et al., 2016), while teachers' knowledge along with their beliefs affect their competencies in understanding situations in the classroom (Meschede et al., 2017).

On the other hand, teachers' beliefs influence their teaching practice and vice versa (Ertmer et al., 2012; Kaya, 2017; Korthagen, 2004; Song & Looi, 2012), though discrepancies between beliefs and practices can be observed too in some situations (Liu, 2011).

Lastly, the teacher as didactical expert seeks to collaborate with colleagues or receive support from the administration (Ertmer et al., 2012) and forms collaborations with teachers from other educational institutions (O'Dowd, 2015) in order to achieve teaching goals.

3.5.3. Teacher as Pedagogical Expert

In general, teaching is perceived as an inherently, perhaps primarily, a moral enterprise (Bullough, 2011), while the pedagogical dimension of teaching is becoming increasingly important in our post-modern societies as teachers face diverse and complicated moral, social, and emotional dilemmas frequently (Beijaard et al., 2000; Bullough, 2011).

Underlying motivation for choosing the teaching profession plays a key role in this identity and affects teachers' beliefs and behaviors as well as their relationships with their students (Abednia, 2012; Korthagen, 2004; Stenberg et al., 2014). Although it could be argued that morals are a matter of opinion, knowledge is perceived fundamental in having a complete picture of what is at stake in a situation and thus be more confident when discussing ethical dilemmas (Mahony, 2009), while ethical decisions can be based on cognitive reasoning and understanding of the issue at hand (Strike, 1990).

The teacher as pedagogical expert nurtures a climate of trust and openness in the classroom (Sheppard & Levy, 2019; Zembylas, 2007), cares about the students, and forms intimate relationships with them (Cowie, 2011; O'Connor, 2008), while when students do not adhere to the classroom rules, display hostile or aggressive behaviors the teacher may experience anger and anxiety (de Ruiter et al., 2019; L. P. Taylor et al., 2020). Investigates with the students social issues beyond the syllabus, such as racism, sexism, and abortion (Cowie, 2011) and often understands that students may have stronger emotional needs compared to learning needs (Cowie, 2011; O'Connor, 2008). Lastly, teacher as pedagogical expert sometimes describes his/her relationship with the students in terms that transcend the stereotypical student-teacher relationship (i.e., mother, friend) (Cross & Hong, 2012).

3.5.4. Teacher as Professional

The teacher as professional identity involves one's motivation for becoming a teacher, knowledge of matters related to the teaching profession, competencies required, beliefs regarding the role and status of the teacher in the educational institution as well as in the society as well as beliefs about the educational system in general, behaviors as a worker of the education field, and relationships with colleagues, administration, authorities, parents, and other people.

The underlying motive for choosing teaching as a profession is a core element of a teacher's identity according to Korthagen (2004). Usually teachers do not have a strictly instrumentalist orientation (e.g., money, no other options, gain experience, etc.) for selecting the teaching career (Abednia, 2012; Fokkens-Bruinsma & Canrinus, 2014; Watt et al., 2014), yet it is reported that promising prospective teachers are not attracted by the teaching profession due to a decline in prestige, deterioration in the working conditions, and the relatively low salaries of the profession (European Commission, 2013). Undoubtedly, underlying motivation has an impact on teachers' relationships with the school principal, colleagues, and students (Nitsche et al., 2011).

The teacher as professional has knowledge of the working conditions, workplace rights and responsibilities, job duties (e.g. fill forms, update students' records, participate in school meetings) (Xu, 2013), and the required competencies (e.g. effective communication with the parents) (Cross & Hong, 2012; Symeou et al., 2012) to fulfill his/her duties in a professional manner. Holds beliefs related to the educational system and the school as institution (Abednia, 2012; Cowie, 2011; Ellison et al., 2018), the teaching profession and professional practices (Naraian, 2010), the status and role of the teacher and the student in the school and society (Abednia, 2012), teachers' education and career progression (Xu, 2013), and the like, while communicates these beliefs both individually (Berrill & Whalen, 2007; Cowie, 2011; Cross & Hong, 2012) and through teacher associations (Ingvarson, 1998).

The teacher as professional often demonstrates flexibility and adapts the instructional practice in order to meet societal and administrative demands (Liu, 2011; Xu, 2013), while collaborates with other teachers in order to achieve his/her instructional goals (Ertmer et al., 2012) and takes part in professional networks to find support and discuss issues of interest (Cowie, 2011; Gorla et al., 2019). Seeks support from the principal when a problem arises (Cross & Hong, 2012) and welcomes parents in the school environment when their

involvement is child-centered and meaningful (Cross & Hong, 2012). Lastly, it could be argued that being a teacher-researcher, an identity that is analysed in Chapter 4, is part of the teacher's work (Lampert, 1984).

3.5.5. Teacher as Learner

The underlying conception of the teacher as learner dates back to Dewey's work (1933), yet learning throughout life - starting from and continuing beyond the confines of the initial teacher education programmes - is a vital characteristic of the teacher in post-modern society (Day et al., 2005).

The teacher as learner has an intrinsic motivation towards learning and knowledge acquisition (Jansen in de Wal et al., 2014; Thomson & Palermo, 2014; Yuan & Zhang, 2017), while holds beliefs regarding how his/her continuing education should be structured (Kennedy, 2011) and the kind of knowledge and competencies he/she needs (Fives & Buehl, 2014; Karagiorgi & Symeou, 2007). Besides, teachers self-direct their learning in their formal education studies (Wittmann, 2011) as well as in informal online environments (Beach, 2017), appreciate autonomy (Banegas & Manzur Busleimán, 2014; De Neve et al., 2015; Hou, 2015), reflect on their own learning (Fox et al., 2015), and increase their self-awareness (K. Lee & Brett, 2015).

The teacher as learner engages in learning activities individually (Anderson, 2019; Burhan-Horasanlı & Ortaçtepe, 2016; Körkkö et al., 2016) as well as in collaboration with colleagues in the workplace (Geeraerts et al., 2015; Kennedy, 2011; Sorensen, 2014), partakes in professional development courses for knowledge and skills enhancement (Gaikhorst et al., 2015; K. Lee & Brett, 2015; Slaouti, 2007), and enters into professional communities to foster learning (Gore et al., 2017; Popp & Goldman, 2016; van Schaik et al., 2019) and find emotional support (Cowie, 2011).

The teacher as learner identity is connected with the other teacher identities as, for instance, memories of past learning experiences inform teacher identities and how teachers empathize with their students as learners (J. L. Cohen, 2010; McGlynn-Stewart, 2015; Woolhouse & Cochrane, 2015), while participation in learning activities has an impact on their beliefs about teaching (de Vries et al., 2013), their knowledge and skills (Gore et al., 2017), and on their teaching practices (Girvan et al., 2016).

3.5.6. Teacher as Political Being

This last teacher identity is rooted in the premises that politics is an inevitable characteristic of human society and as such it is impossible to establish an educational process that is politically neutral and value free (Freire, 1985), while the teacher cannot be divorced from his/her political identity which brings into the classroom (Kelchtermans, 2005; Van Galen, 2017). As pacifist and educator Morris Mitchell acknowledged “a teacher teaches who he (sic) is” (Rodgers & Scott, 2008, p. 744). In other words, a teacher is a member of a society and holds several other identities related to the social life which, some of them at least, emerge in the educational process and/or are related to the rest of the teacher identities.

A teacher’s broad knowledge and overall awareness of sociopolitical matters at local and global level has an impact on his/her beliefs (Castéra et al., 2018; Nousheen et al., 2020) as well as on his/her relationship with the students (Bar-Tal & Harel, 2002). Teachers perceive inequities in the education system (i.e. under-resourced, stratified, and segregated schools, sociological issues students and their families face outside of school) and understand these inequities as being linked to larger, systemic issues in society that plague schooling as a whole and maintain an inequitable status quo (Cross & Hong, 2012; Ellison et al., 2018; Frederick et al., 2010; Van Galen, 2017).

Teachers stand critical of the institutionally or socially imposed role of the teacher as well as the regulations imposed by the authorities (Abednia, 2012) and they resist to the ‘business world’ ethos of the school (O’Connor, 2008). Furthermore, they critically question the curriculum as it may be culturally insensitive (Abednia, 2012; Loh & Liew, 2016), while they try to support and encourage their students in becoming critical thinkers as well as independent and self-sufficient persons (Abednia, 2012; Loh & Liew, 2016; van Veen et al., 2005). In areas with high socio-economic problems (i.e., poverty, unemployment, diseases, etc.) teachers exercise agency to make a significant change in the lives of their students, families, and the broader society (Ebersöhn & Loots, 2017). Lastly, teachers will seek to engage parents and raise their awareness of the political situation (Abednia, 2012).

3.6. Characteristics of Teacher Identities

As discussed in Chapter 2, in this thesis identity is conceptualized as being created, relational, multiplistic, decentered, dynamic, context specific, fluid, and occasionally fragmented. The following paragraphs analyse how each of these characteristics is manifested in teacher identities.

3.6.1. Teacher Identities as Constructed

Although the nativist myth that ‘good teachers are born’ is still alive in the minds of people (Scott & Dinham, 2008), the construction of a teacher identity is recognized as a process of creation and becoming, rather as an inherent characteristic that needs to be discovered. The construction of a teacher identity is particularly manifested when student-teachers articulate their emerging identities as teachers (Abednia, 2012; Flores & Day, 2006; Nesje et al., 2018; Sutherland et al., 2010; Timoštšuk & Ugaste, 2010) or as subject-specific teachers (Kier & Lee, 2017), when they imagine their future teacher identities (Choi et al., 2016; S. Lee & Schallert, 2016; Xu, 2013), and when they make the transition to practicing teachers (Bertau & Tures, 2019; Henry, 2019; Lynn Thomas & Beauchamp, 2007).

Construction of a ‘new’ or ‘extra’ teacher identity is also observed when experienced teachers make a transition in teaching of some kind, i.e. from face-to-face to online teaching (Jonker et al., 2018), from teaching in a nursery to teaching in a primary school (Monereo, 2019), engagement with innovation and inquiry (Konstantinidis & Badia, 2019; Monereo & Badia, 2020), etc.

3.6.2. Teacher Identities as Relational

Teacher identities are relational, in the sense that they acquire meaning, develop, and operate in relation to difference from other identities. A few examples that exemplify the relational character of teacher identities with reference to the teacher as subject matter expert, teacher as didactical expert, teacher as pedagogical expert, and teacher as professional identities are provided in the following paragraphs.

Teachers often label themselves or other teachers on the basis of their real and perceived knowledge and competencies in the subject area (e.g., language expert vs moderately proficient, subject expert vs unqualified teacher, etc.) (Timoštšuk & Ugaste, 2010; Xu, 2013).

Teachers may differentiate their beliefs and/or practices in terms of educational theories and practices (e.g., traditionalists vs nontraditionalists or innovators, face-to-face vs blended) or with the beliefs and practices of other teachers (Jonker et al., 2018; Lopes, 2002). Teachers often contrast their aspiring teacher’s role with their pragmatic practices (e.g. spiritual guide vs routine performer) (R. Brown & Heck, 2018; Xu, 2013) or with the practice that is presumed from the context (Clarke et al., 2017; Naraian, 2010). Additionally, teachers contrast their past with their current beliefs on teaching and learning (Abednia, 2012; R. Brown & Heck, 2018; S. Lee & Schallert, 2016). Furthermore, teachers make comparisons

regarding the knowledge and skills needed in different educational modes (blended vs face-to-face) (Jonker et al., 2018).

Teachers construct identities related to the relationship with their students (e.g. builder of community vs authority, realist vs co-learner) (R. Brown & Heck, 2018), while they imagine how their students perceive them as teachers (self-perceived teacher identity vs imagined through students' eyes teacher identity) (Stenberg, 2010).

With respect to the teacher-professional identity, teachers commonly differentiate according to the discipline, for instance, doctors vs engineers (Lopes, 2002), general vs special education (Naraian, 2010), native-language support teachers vs other teachers (Virta, 2015) and to the professional status within the teaching occupation (e.g. privileged vs non-privileged status) (Lopes, 2002). Additionally, some teachers may identify themselves professionally with the practice of the discipline (art teacher vs artist, music teacher vs singer) (Kenny et al., 2015; Timoštšuk & Ugaste, 2010). Lastly, teachers contrast the different roles they have to acquire within the school context (e.g. equal to students vs authority) (R. Brown & Heck, 2018).

3.6.3. Teacher Identities as Multiplistic

Although teacher identity is often referred to as a singular construct, in essence it is composed of several identities as it is demonstrated in section 3.7.2. The different identities that a teacher has can cooperate and support each other or can even be contradictory. Hence, for instance, one's identity as a parent may support the development of the teacher identity (particularly the teacher as pedagogical expert) (Friesen & Besley, 2013). On the contrary, the teacher as subject matter expert can contradict with the teacher as professional identity when it is perceived that other criteria beyond expertise in subject matter are considered important for promotion (Xu, 2013). Similarly, a teacher's identity as professional can

contradict with a teacher's identity as a political being when, for instance, there are family pressures regarding time allocated time for work and/or worries about the salary (Timoštšuk & Ugaste, 2010) or when the teacher's role feels intolerable (Day & Leitch, 2001). Conflicts can be observed within the same teacher sub-identity, when beliefs about teaching and learning are not in alignment with teaching practices due to external factors (Christensen, 2016; Liu, 2011; Xu, 2013).

3.6.4. Teacher Identities as Decentered

Teacher identity is decentered as a result of its relational and multiplistic character. Although, the more important a teacher sub-identity is to a teacher, the greatest centrality it has, any single teacher sub-identity cannot completely occupy the centre of a teacher's self. Only temporarily a sub-identity can acquire a position close to the centre for at any moment other teacher sub-identities come into play, while when the situation changes it is displaced and decentered by other identities. This is particularly manifested when teachers talk about the double roles that they perceive they have in relation with their students (e.g. builder of community and authority, realist and co-learner, teach the curriculum and the whole child, etc.) (R. Brown & Heck, 2018; Lasky, 2005).

3.6.5. Teacher Identities as Dynamic

Teacher identities are dynamic, in the sense that they are becoming more central or more peripheral depending on the context. Hence, for example, teachers' identities are becoming more central at school rather at home (O'Connor, 2008). Similarly, during the teaching process it can be safely assumed that the teacher as didactical expert is becoming more central, while the teacher as political being more peripheral. In the same way, when teachers participate in professional development courses, the teacher as learner identity is becoming more central (Fox et al., 2015), while other teacher identities are decentered.

3.6.6. Teacher Identities as Context Specific

Teacher identity is dependent upon the contexts in which a teacher is immersed: classroom, school, teacher meetings, teacher education programs, educational innovation, family, social contexts, political parties, and so forth. A given educational context does not have the same impact to all teachers and as such different identities can be evoked and/or become more salient to each teacher. Hence, for instance, engagement with an educational innovation gives rise to different identities among a group of teachers (Monereo & Badia, 2020). While it can be argued that in the classroom, the teacher identities as subject matter expert, didactical expert, and learning facilitator will become more salient, still the extent to which each one of these identities as well as other teacher identities will be evoked depends on the individual teacher.

Staying on the context of the classroom as an example, it shapes the teacher's identities when the teacher imagines how the students perceive him/her (Stenberg, 2010), when receives student feedback (Timošćuk & Ugaste, 2010), and even by the way the classroom interior is designed and the classroom rules that have been established (Naraian, 2010). Thus, the resources that the context provide (i.e. a class with noisy students) (Stenberg, 2010) affect the teacher identities.

Lastly, bearing in mind that the more salient one teacher identity is, the more probable is that that identity will be evoked across contexts, teachers who have, for instance, a salient teacher as subject matter expert identity will evoke that identity in, i.e. relationships with their colleagues and administration (Xu, 2013), where it could be assumed that other teacher identities should have been more central.

3.6.7. Teacher Identities as Fluid

Rather than being fixed, teacher identities are fluid and develop according to the situation and over time. When a teacher identity is activated in a situation, an unconscious and relatively automatic identity control process starts that guides the individual in performing that identity as well as in comparing the performance with the way he/she sees himself/herself as having the given identity. Depending on feedback from the environment, the teacher may feel that his/her identity is verified and experience positive emotions or may feel that there is a non-correspondence between his/her internalized identity and the way others perceive him/her and experience negative emotions, in which case he/she will work in order to resolve the discrepancy.

Hence, for example, for student-teachers the development of teacher identity is better described as “an ongoing process of interpretation and re-interpretation of experiences” and “a path with highs and lows”, rather “as a steadily ascending line” (P. C. Meijer et al., 2011, p. 127).

As regards in-service teachers, it was found that although they sustain rather stable goals as regards their performance in the classroom during the school year, these goals are significantly affected by the particular occasions they are immersed in (Praetorius et al., 2014). Furthermore, it was revealed that teachers’ own learning goals show low stability during the school year (Praetorius et al., 2014). Undoubtedly, the goals a teacher sets are important aspects both of the current (who I am) and of the aspiring teacher identity (who I want to become).

The fluid character of teacher identities is especially manifested when teachers engage in identity work and re-construction of their teacher identities through reflective talk and discussion with colleagues in their workplace (J. L. Cohen, 2010), in professional

development programmes (Stenberg, 2010), and in the context of an educational innovation (Monereo & Badia, 2020).

Although teacher identities are never fully and finally established, the more frequent a teacher holds a specific teacher identity or the harder the teacher works to verify that identity, the more salient that identity becomes. Hence, for instance, late-career teachers have more fixed teacher identities, as demonstrated by their reluctance to change, compared to mid and early career teachers (Hargreaves, 2005), since it could be assumed that over time some of their teacher identities became very salient. Contrarily, early career teachers are more flexible and adaptable to a change for they have not worked many years to verify their teacher identities.

3.6.8. Teacher Identities as Fragmented

Teacher identities can be at times fragmented as a result of the coexistence of radically different or contradictory teacher identities within a teacher's self. Rather than being closed and entirely determined by institutional, social, and cultural structures, teacher identities are always open and always in the process of formation. Hence, there is not a single trajectory for the formation of i.e. the teacher as discipline expert or the teacher as pedagogical expert identity, while teachers have to negotiate on every occasion the ways they will experience and perform their identities in the institutional context. Nevertheless, institutional, social, and cultural structures do establish a set of norms for the various roles of the teacher and impose identities on the teacher (Reeves, 2018). Therefore, on the one hand the teacher exercise agency in performing his/her identities and on the other hand experiences the power of imposed identities on him/her (Day & Leitch, 2001). When there is radical contradiction among the imposed and performed or aspired identities the teacher may experience his/her teacher identities as fragmented which is always accompanied with

emotional exhaustion and a tendency to quit (Atmaca et al., 2020; Lavy & Eshet, 2018; Loh & Liew, 2016; Uitto et al., 2015).

3.7. Using the MoE for Interpreting Teacher Identities

The MoE is a concept developed by Fromm in 1976 that attempts to describe the fundamental factors underlying the individuals' daily behaviors, ways of thinking, acting and reacting to the external and internal worlds. In his psychological theory two fundamental modes of existence are identified: 'being' and 'having'. According to Fromm (2008, p. 14; emphasis in the original) "*having and being are two fundamental modes of experience, the respective strengths of which determine the differences between the characters of individuals and various types of social character*". Based on a variety of theoretical sources that discuss basic human tendencies to act and to do, Rand (1993 cited in E. H. Cohen et al., 2005) proposed a third mode of existence to Fromm's dual model that he called 'Doing'. In his triadic model, the three modes exist concurrently in each individual, but, in general, one mode dominates the two others. In the following paragraphs, the three modes are looked into more depth, while the themes of learning and knowledge, fear and security, joy and pleasure, and activity are discussed with reference to each mode.

3.7.1. The 'Having' Mode of Existence

The 'Having' mode of existence, as Fromm (2008) describes it, refers to the individual's tendency to relate to his whole world, occupation, relations with others, even activities, habits, and ideas, in a manner characterized mainly by egoism, control, and acquisitiveness. 'Having' appears to be a relatively simple concept, since every individual *has* something (e.g. clothes) while also the 'Having' mode is frequently and powerfully manifested in the 'consumer society' we live in. Through a number of everyday life examples Fromm illustrates how the 'Having' mode of existence is demonstrated.

In learning, the having mode of existence is characterized by a tendency to memorization, alienation from the content, and orientation towards the performance (i.e. pass the exam). While production of something new is not required, new ideas and thoughts are disturbing and often frightening as they put into question the established information and might be difficult to control them. Knowledge is approached as a commodity and the goal is to *have* more knowledge, but in a sterile manner without trying to make connections or pursuing a further insight beyond the surface. As aforementioned, the 'Having' mode is also connected with feelings of fear and insecurity, since, as Fromm explains:

Not to move forward, to stay where we are, to regress, in other words to rely on what we have, is very tempting, for what we *have*, we know; we can hold onto it, feel secure in it. We fear, and consequently avoid, taking a step into the unknown, the uncertain... the new aspects beyond [that step] appear very risky, and hence frightening. Only the old, the tried, is safe... Every new step contains the danger of failure. (2008, p. 88)

Moving from feelings of fear to satisfaction, it is worth examining how individuals in the 'Having' mode seek pleasure. In the 'consumer' society pleasure is primarily connected with social success, commodities, lust, and wealth. Fromm broadly defines pleasure "as the satisfaction of a desire that does not require activity (in the sense of aliveness) to be satisfied" (2008, p. 94). Although it can be argued that individuals in the 'Having' mode may need to work hard in order to earn more money or become famous, this activity does not lead to their inner growth and strength nonetheless. As Fromm puts it, they are "very active in the sense of busyness, but not in the sense of the 'birth within.'" (2008, p. 95). As such, the individual is alienated from the activity. Surely, having-type individuals can experience the outcome of their activity, but as something separated from themselves. They "do not really act", instead

they are “*acted upon* by external or internal forces” (Fromm, 2008, p. 74; emphasis in the original).

3.7.2. The ‘Being’ Mode of Existence

In the mode of ‘Being’, the individual’s inclination to develop, share, and proceed towards self-actualization and fulfillment is identified. ‘Being’ goes beyond appearance and denotes the authenticity and essence of a person. It is, thus, “more than a statement of identity” and “more than a descriptive term for a phenomenon” (Fromm, 2008, p. 20), such as I am man, I am poor, I am teacher, and so on.

Learning is a deeply active process in the ‘Being’ mode. Hence, individuals enter into the learning process not as ‘*tabulae rasae*’ but as critical thinkers who are occupied with the topic at hand. They have already in mind their own questions related to the topic and the new information stimulates their thinking and produces new ideas and perspectives. Rather than approaching knowledge as something that “they can take home and memorize” (Fromm, 2008, p. 25), at the end of the learning process each being-type individual is affected and changed.

Subsequently, change through learning is something desirable for being-type individuals and they are not afraid such change. Since they base their center within themselves, rather on external objects, they do not feel that their security or sense of identity is threatened. They can have a vision of the new; they do not afraid of breaking a new path and moving forward.

In moving forward and growing as a person is where joy can be found in the ‘Being’ mode. While anyone can enjoy sensuous and momentary pleasure, eudemonia (well-being) “consists not in pleasures but in activities whose realization is conducive to human growth” (Fromm, 2008, p. 3). When being-type individuals are engaged in such activities they are

entering into “a process of giving birth to something, of producing something” (Fromm, 2008, p. 74), while, at the same time, remaining related to the outcome. This implies that the individual, his/her activity, and the result of the activity “are one” (Fromm, 2008, p. 74).

3.7.3. The ‘Doing’ Mode of Existence

Lastly, the ‘Doing’ mode of existence, as proposed by Rand (1993 cited in E. H. Cohen et al., 2005), refers to the inclination of the individual toward doing things, while also deriving satisfaction from the actual process of doing. As a concept, ‘Doing’ is relatively simple and common since people in their daily life are frequently involved in activities of some kind. It is also a prominent characteristic of our society as individuals who are particularly energetic are commonly referred as ‘doers’, which essentially means that they have both the abilities and the tendency to engage with tasks in an efficient and effective way, while they also have the aspiration to alter their surroundings.

This tendency towards doing characterizes the way knowledge and learning is perceived and approached by doing-individuals. Thus, knowledge is regarded as a tool by means of which tasks can be performed in a more effective and efficient way. As such, learning has a dual orientation and a highly practical function for doing-type individuals; both to develop their own operational abilities and to change the external environment (E. H. Cohen et al., 2005).

Thus, the process of doing is interdependent with both the inner and the outer worlds of the individual. While doing-type individuals derive satisfaction from the actual process of doing they do not act in a vacuum or with no underlying reason or aim. The way doing-type individuals experience their environment generates feelings of “indispensability and creativity”, which in turn are expressed with “a massive diversion of inner energy into the act

of doing and into the fostering of the ability to accomplish at different levels” (1993 cited in E. H. Cohen et al., 2005, p. 3).

3.7.4. The MoE in Educational Settings

Literature on the three MoE in educational settings is scarce to say at least. Overall, there are two types of studies: three quantitative studies that primarily aimed to confirm the underlying concepts as well as identify the dominant MoE in a population comprised by educational stakeholders and a qualitative study that used the three MoE as a lens to analyse teacher identity.

Reichenberg (1996 cited in E. H. Cohen et al., 2005) constructed a scale comprising of 51 Likert items that measures the level of the three modes. The scale was administered to 109 students from colleges of education, 76 cooperating teachers, and 201 educational counselors; all of the respondents were female. The reliability and validity of the scale as well as the validity of the three underlying constructs was demonstrated by Reichenberg (1996 cited in E. H. Cohen et al., 2005) as well by two subsequent studies using the same data by Sagee (1996 cited in E. H. Cohen et al., 2005) and Cohen et al. (2005). The three studies have shown that the reliability of the questionnaire is high, while the three underlying factors were also confirmed, even though to a low extent (the total percentage of variance explained by the three factors was only 34%). Furthermore, the results showed a clear hierarchical pattern of the three modes among the three groups: the prominent MoE was ‘Being’, followed by ‘Doing’, and finally ‘Having’. Lastly, relationship between the modes and different variables (such as positions regarding instruction and religion beliefs) were also revealed.

From another standpoint, Avidov-Ungar and Forkosh-Baruch (2018) used the MoE as a lens to analyse teachers’ subjective interpretation of their teacher identity with regards to pedagogical innovation using technology within the setting of an educational institution. In

doing so, they appropriated the three modes of existence to three different perceptions of the teacher professional identity. Hence, in the context of the pedagogical innovation the 'Being', the 'Having', and the 'Doing' MoE were attributed to the conceptual, the contextual, and the practical aspects to the development of the teacher identity respectively. The analysis of the phrases of the respondents revealed three major domains within the 'Being', two types of needs within the 'Having', and three types of activities within the 'Doing' mode in light of the pedagogical innovation. More specifically, within the 'Being' mode, the three domains found were: pedagogical, disciplinary, and management of change. The pedagogical domain included three components: a) understanding the need for change in teaching methods; b) understanding the need to refer to students in a different manner; c) the need to perceive teaching in a more systemic manner. The disciplinary domain included two components: a) acquisition of relevant professional knowledge and personal experience in pedagogical innovation and b) acquaintance with novel pedagogies that are relevant to the disciplinary domain. The management of change domain included four components: a) the ability to adapt to change; b) the role of students in leading this change; c) utilization of pedagogical innovation in leading change; and d) coping with overloads and challenges as part of the change. Within the 'Having' mode, two major needs from the environment were found: needs related to their students and needs related to the institute/system. Lastly, within the 'Doing' mode, three main activities were identified: a) activities required from teachers in order to implement pedagogical innovation; b) pedagogical and c) technological activities of teachers in classroom teaching.

The findings from the study by Avidov-Ungar and Forkosh-Baruch (2018) are in accordance with the studies focusing on MoE in educational settings, while a new viewpoint to the perception of teacher identity is also created. Thus, it was shown that teacher identity is comprised of the three MoE and it was confirmed that the dominant mode is 'Being',

followed by 'Doing', and lastly 'Having'. In addition, the study by Avidov-Ungar and Forkosh-Baruch (2018) has illustrated that there are several components and sub-components of the teacher identity that relate to the pedagogical innovation. Hence, the 'Being' mode focuses on the pedagogical and didactical components related to the changing role of teachers while conducting a pedagogical innovation as well as with the skills and competencies needed to manage the change processes, the 'Having' mode on the needs of teachers from their professional environment, and the 'Doing' mode on implementation actions which are part of teachers' role.

3.8. Synopsis

The concept of teacher identity face similar understanding and definition problems that torment the fore-concepts of self and identity.

In order to achieve a better understanding of how teacher identity evolved into its current meanings, the early and modern conceptualizations of teacher identity were briefly reviewed before examining how teacher identity became an important concept in the last half century.

Hence, in most of human history the teacher identity was chiefly related to knowledge of a subject whereas teaching was considered simply a process of knowledge transmission.

With the rise of mass schooling the criteria for acquiring a teaching position were lowered and as a result the conceptualization of the teacher as a subject matter expert gradually faded away. Although the first formal teacher education systems emerged during this period, teaching was largely considered a technically simple process that involved knowledge transmission and classroom management and as such the interest on the concept of the individual teacher was limited to non-existent.

However, the last decades the interest on teacher identity has increased exponentially which was a result of an elaborated understanding of the teaching process in parallel with a more holistic examination of a teacher's life.

Since teacher identity was an uncharted territory, scholars and practitioners in the education field turned to the fields of psychology and social sciences to understand its meaning, where, as it was documented in Chapter 2, not only there is an absence of a widespread definition of identity, but there is still disagreement regarding the difference and precise meaning of self and identity, while lacking a shared understanding of what identity exactly is. Unsurprisingly, thus, the concept of teacher identity suffers from problems that at least to some extent are rooted to the definition problems of the fore-concepts of self and identity.

Elaborating on the definition of identity that was presented in Chapter 2, this chapter puts forth that *the teacher identity includes the personal traits and characteristics as well as a teacher's social relations, roles, and memberships that are activated during the teaching process as well as during out-of-school activities related to the teaching process and the teacher's professional life in general.* The elements of the teacher identity determine a teacher's motivations, beliefs, knowledge, skills, and behaviors on topics related to teaching, learning, and the teaching profession while direct the teacher's focus on features of the immediate professional context and his/her subsequent actions.

Based on the definition and drawing from the literature six types of teacher identities (teacher as subject matter expert, teacher as didactical expert, teacher as pedagogical expert, teacher as learner, teacher as professional, and teacher as political being) were identified and their components were briefly analysed.

After that, it was explicated how the characteristics of teacher identities are manifested. In short, teacher identities are constructed (rather than being inborn idiosyncrasies), relational (operate in relation to difference to other teacher identities), multiplistic (although often referred to as a singular construct, teacher identity is actually composed of several identities), decentered (any single teacher identity cannot completely occupy the centre), dynamic (teacher identities are becoming more central or more peripheral depending on the context), context specific (teacher identities dependent upon the contexts in which the teacher is immersed: classroom, school, social contexts, etc.), fluid (teacher identities develop according to the situation and over time), and occasionally fragmented (as a result of the coexistence of radically different or contradictory teacher identities within a teacher's self).

Last but not least, the three modes of existence help us understand the fundamental factors that underlie the individual's identity. Hence, an individual characterized as a 'Having' type, understands his/her identity through the objects and persons that he/she relate with: "*I am I because I have X*" (Fromm, 2008, p. 63; emphasis in the original). Conversely, being-type individuals sense their identity from their internal resources and potential: "*I am I because I am my inner self*". Lastly, an individual characterized as a 'Doing' type, achieves his/her identity by the deeds he/she performs and by the formation of conditions that are crucial to the attainment of his/her goals: "*I am I because I am doing Y to realize Z*".

The three MoE can be utilized as a lens to analyse teacher professional identities and, more specifically, when teachers are engaged with an educational innovation. Overall, among educational stakeholders it was shown that there is a clear hierarchical pattern: the prominent MoE is 'Being', followed by 'Doing', and finally 'Having'. In the context of an educational innovation the 'Being', the 'Having', and the 'Doing' MoE were attributed to the conceptual, the contextual, and the practical aspects to the development of the teacher professional

identity respectively. It was found that there are three major domains within the 'Being', two types of needs within the 'Having', and three types of activities within the 'Doing' mode.

Additionally, it was realized that there are several components of the teacher identity that relate to the educational innovation. Hence, the 'Being' mode focuses on the pedagogical and didactical components related to teachers' changing role as well as with the skills and competencies needed to manage the change processes, the 'Having' mode on the needs of teachers from their environment, and the 'Doing' mode on teachers' implementation actions.

4. Teacher-Inquirer Identity

4.1. Introduction

As we have seen in Chapter 3, the definition of teacher identity as well as its characteristics (i.e. multiplistic) enable the conceptualization of several distinct types of teacher identities (i.e. teacher as subject matter expert, teacher as learner, etc.) that they are becoming more central or more peripheral depending on the context. Add to that, it is also made clear in the definition that the teacher identity is far from monolithic; instead it includes several components, such as personal traits, social relations, roles, and so on.

The conceptualization of the teacher as inquirer is far from new. It goes back as far as to the beginnings of the 19th century to the work of John Dewey (1904) and perhaps centuries backwards to the research the members-teachers of Aristotle's Lyceum conducted (Shields, 2016), yet it became popular with the action research movements in mid-19th century (Kemmis et al., 2014). In general, it could be argued that taking a research approach to teaching is an inherent part of teachers' work (Lampert, 1984). Nowadays, the teacher-inquirer is one of the most influential paradigms for teacher education models (Menter et al., 2010) and it is increasingly attracting the interest of teacher educators and educational associations (Furlong et al., 2014; Munthe & Rogne, 2015; Priestley & Drew, 2019).

The aim of this chapter is to define the teacher-inquirer identity and identify some of its main components. More specifically, the chapter aims to construct a theoretical model regarding the inquiry skills that are developed during inquiry. Add to that, the chapter examines four elements of teacher identity that are particularly triggered during professional development, that is agency, sense-making, ownership, and emotions.

4.1.1. Chapter Structure

Drawing from literature on action research and research in social sciences the next section provides a definition of the teacher-inquirer, while section 4.3. identifies the skills included in the teacher-inquirer identity. In section 4.4. it is examined how agency, sense-making, ownership, and emotions affect the teacher-inquirer identity when the teacher is engaged in professional development opportunities. Lastly, section 4.5. provides a synopsis of the chapter.

4.2. Definition of the Teacher as Inquirer

While definitions of teacher inquiry or teacher research are abundant in the literature, it is necessary to carve out of the studies the definition of the teacher as inquirer. The problem becomes more complicated by the existence of different approaches to conducting inquiry or research in education (Ponte, 2005; Santa & Santa, 1995), which lead to different understandings of the inquiry process and subsequently of the teacher as inquirer. It should be noted here that though the terms ‘teacher inquiry’ and ‘teacher research’ are typically used interchangeably in the literature, they bear different connotations (Munthe & Rogne, 2015).

In this thesis the definition of the teacher-inquirer is formulated as an umbrella construct that intends to embrace the different conceptualisations and approaches of teacher inquiry and research. In general, there are three ways that a teacher can do inquiry: a) inquire his/her own practice and/or students’ learning, b) collaborate with other teachers or researchers in conducting inquiry in an institutional context, and c) help or collaborate with other teachers to conduct an inquiry on their classroom settings. Thus, in broad terms, *teacher-inquirer might be called the teacher who identifies an important educational situation that should be studied or improved, explores related resources to build understanding, designs and implements an inquiry project, evaluates the outcomes of the project and reflects on it, and, finally, shares the project outcomes with the community.*

4.3. Skills of the Teacher-Inquirer

Skills are an important part of a teacher's identity and this is corroborated by studies that demonstrate that the level of cognitive development (high vs low) has an impact on teacher identity (Bullough et al., 2008; Friesen & Besley, 2013; Sutherland et al., 2010). Similarly, inquiry skills are viewed fundamental for the development of the teacher-inquirer identity by student-teachers (Giralt-Romeu et al., 2020).

For identifying the skills of the teacher-inquirer identity two different, but related, areas were reviewed: action research and research in social sciences. While studies on action research are the major focus of the literature review, the arguments are supported with studies from research in social sciences since the two fields share many characteristics in the way research is approached and conducted. Hence, it is widely held that strategies from the social sciences can be used to solve practical problems in education (Atkin, 1992). Add to that, the connection of action research with research in social sciences is explicated in definitions of action research that emphasise the social context; for instance, according to Elliott action research is "the Study of a social situation with a view to improving the quality of action within it" (1991, p. 69).

From the literature review five different phases or skills of inquiry are identified: searching and focusing, understanding and exploring, designing and implementing, evaluating and reflecting, writing and presenting. These skills are analysed in the following paragraphs.

4.3.1. Searching and Focusing

The first crucial steps in any inquiry are to search for potential problems or issues to inquire and clearly identify and focus on a particular topic. The two processes, searching and

focusing, are usually presented and discussed as inseparable in the literature (Elliott, 1991; Hopkins, 2008; Pelton, 2010).

Therefore, the teacher-inquirer identity includes skills related to searching for potential problems, questions, and issues that could be further explored (Brause & Mayher, 1991; Elliott, 1991; Pelton, 2010) and focusing on a particular problem (Elliott, 1991; Timperley et al., 2014).

Searching

Two main areas or ways of searching for possible topics for inquiry are proposed in the literature. The first is chiefly related to the students, such as searching for problems in students' learning or improving a condition for students, while the second is chiefly related to the teacher, such as searching for problems in teaching practice or searching for topics of personal and professional interest. The former is usually emphasized in action research literature (Pelton, 2010; Timperley et al., 2014), whereas the latter in social science research (Bell & Waters, 2014), yet rather than being antithetical, the two areas are strongly interrelated. Hence, for instance, addressing a problem in students' learning will potentially lead to an improvement in teaching practice and, conversely, pursuing a topic of personal interest will potentially improve a condition in students' experience of school life. From a different viewpoint, Mertler (2017) recommends that the teacher-inquirer should have a personal interest in the potential topic since he/she will be spending a lot amount of time working on it so it is important that he/she enjoys this engagement.

According to Timperley et al. (2014) the teacher-inquirer should make a systematic search about what happens with learners and check out the extent to which their experiences reflect what is currently known about learning. Initially the teacher-inquirer may have many or no ideas about what to inquire. In any case, the adoption of a genuinely curious and open

attitude to all kinds of information regarding learners and the educational process is suggested (Brause & Mayher, 1991; Timperley et al., 2014). In the same vein, Brause and Mayher (1991) suggest that the teacher-inquirer can identify researchable questions by studying the contexts of curricular decisions (students, subject, teaching/learning of the subject, school community, teacher's self-conception) in relationship with the instruction goals, plans, activities, feedback, and learning evaluation. Similarly, Stringer et al. (2010) emphasize the need of gathering relevant information for comprehending the wider picture and, subsequently, the teacher-inquirer can define and describe the situation at hand.

The second way of searching for potential topics builds on the assumption that the teacher-inquirer is already aware of potential problems in the working context and places the interests and concerns of the teacher-inquirer at the center. Hence, creating a list with questions, issues, and interests that one wants to inquire is a frequently suggested tactic during searching (Bell & Waters, 2014; Booth et al., 2016; Hopkins, 2008; Pelton, 2010). Reflection is also suggested as a way of searching for potential topics, either by acquiring a better self-understanding of oneself as a teacher (Hendricks, 2017) and examining one's own teaching practice (Brause & Mayher, 1991) or by analyzing the collected information (Stringer et al., 2010). Other tactics for searching for potential issues for inquiry include following one's own hunches or feelings about potential issues for inquiry (Blaxter et al., 2008; Pelton, 2010), starting from a general idea of what might be improved (Hopkins, 2008), extracting from the literature a quote that engages one's attention (Blaxter et al., 2008), looking at previous research work (Blaxter et al., 2008), and asking other people (academics, colleagues, family, friends, etc.) for ideas (Blaxter et al., 2008; Pelton, 2010).

Focusing

After identifying potential topics for inquiry, the teacher-inquirer needs to focus on a particular topic. This stage is crucial for it determines where the teacher-inquirer will direct

his/her attention and energy during the inquiry (Timperley et al., 2014). While the process of focusing appears to be quite straightforward, it takes place over time (Bell & Waters, 2014; Blaxter et al., 2008; Timperley et al., 2014) and a range of skills can be exercised during focusing.

The searching will invariably lead to many potential topics and the challenge for the teacher-inquirer is to determine which area to concentrate on as a start (Timperley et al., 2014). At this point, the teacher-inquirer needs to slow down and develop a deeper understanding of what is worth spending time on before moving on (Timperley et al., 2014). As a first step a reduction of the topics to a choice of two is suggested, picking up for further examination the ones that appear to be more interesting and more manageable (Bell & Waters, 2014; Pelton, 2010).

What is more crucial during this stage, nonetheless, is the refinement of the topic and formulation of research questions. The reflective and critical thinking skills of the teacher-inquirer are essential for clarifying thoughts, ideas, and questions and identifying the purpose of the inquiry (Bell & Waters, 2014; Elliott, 1991; Stringer et al., 2010). In order to clarify the nature of the problem and to frame research questions highly focused information regarding the selected topic should be identified and collected (Brause & Mayher, 1991; Elliott, 1991; Timperley et al., 2014). In the initial phases of the inquiry the use of secondary sources (i.e. encyclopedias, research reviews, handbooks of research, etc.) is advised for gaining a broad perspective on the area (Mertler, 2017). Additionally, the teacher-inquirer can utilize a number of tactics towards the refinement of the topic and the research questions including defining key concepts and issues, sketching a research outline, crafting a working title, explaining the topic in simple language, informal piloting, reading research, keeping a research diary, brainstorming, discuss ideas with the supervisor or teacher mentor, and so on (Bell & Waters, 2014; Blaxter et al., 2008; Booth et al., 2016; Elliott, 1991; Pelton, 2010).

Finally, the teacher-inquirer should evaluate the potential of the study. At the outset a preliminary search on the internet to check whether similar research has been conducted is recommended (Bell & Waters, 2014; Booth et al., 2016). The teacher-inquirer should ensure that the research questions do not have broad neither overly narrow focus for broad questions are impossible to be researched given the limitations in time, resources, budget, and so on that a teacher faces (Hendricks, 2017; Hopkins, 2008; Mertler, 2017), while overly narrow questions present challenges in the data collection process (Booth et al., 2016; Mertler, 2017). Lastly, the teacher-inquirer should ensure that the research questions meet several criteria: they are centered on areas with high impact and at the same time they are manageable (Mertler, 2017; Timperley et al., 2014), they are relevant to the teacher-inquirer's (Blaxter et al., 2008; Hopkins, 2008) and students' needs (Hopkins, 2008; Stringer et al., 2010), they can be addressed in the time available (Bell & Waters, 2014; Mertler, 2017), they can be answered through collecting data and utilizing resources which are accessible (Brause & Mayher, 1991), and they conform with any regulations that the teacher-inquirer should be operating under (Blaxter et al., 2008; Hopkins, 2008; Mertler, 2017; Stringer et al., 2010).

4.3.2. Understanding and Exploring

After selecting the topic, the teacher-inquirer needs to build knowledge on the topic area and explore what other teachers and researchers have done while investigating similar issues and problems (Brause & Mayher, 1991). It should be noted here that building understanding on the topic and exploring what others did in the area are core stages in social science research, whereas in action research literature these processes are usually perceived as peripheral in the teacher inquiry and in most models they are only superficially presented and discussed.

The two processes, understanding and exploring, share the overarching aim of deepening the teacher-inquirer's knowledge and understanding, yet they differ on the way

this is achieved. While the process of understanding is more related to finding and reading existing resources (i.e. articles) the process of exploring is more related to interacting with other people who have expertise in the topic area

Therefore, the teacher-inquirer identity includes skills such as finding related literature, studying resources, organizing information, and interacting with people who have knowledge in the area. The next paragraphs analyse in more detail the skills associated with understanding and exploring.

Understanding

In the first phase, searching and focusing, the teacher-inquirer has to make a preliminary search to find and then study resources related to the topic and questions of the inquiry. During the process of understanding the teacher-inquirer exercise in greater depth skills in searching and finding related literature and gets more engaged in studying and reviewing the resources found.

Searching for related literature is considered a basic skill and perhaps for this reason is rarely discussed in action research and research in social sciences literature, although coping with the literature can be an overwhelming experience even for experienced researchers (Blaxter et al., 2008). For conducting a systematic literature search several skills are required as it will be explained. First, the teacher-inquirer should be aware that internet searches are not recommended for finding reliable resources and it is advised that libraries (digital or traditional), such as ProQuest, ERIC, ScienceDirect, the university library, etc. are used (Hendricks, 2017). Second, for conducting an effective search the teacher-inquirer has to be able to define the parameters and keywords of the search as well as check whether they are clear and return useful results (Bell & Waters, 2014). If the search returns many irrelevant results it means that the keywords need to be refined and/or changed. Changing of keywords

is also recommended as a tactic to expand or limit searches depending on whether too few or too many articles are found (Hendricks, 2017). Lastly, the teacher-inquirer develops various other skills while searching the literature, such as identifying prominent authors and key texts in the topic area, following up interesting references, using Boolean operators effectively, and so on (Blaxter et al., 2008).

Once the resources are located, it is crucial that the teacher-inquirer is able to evaluate their usefulness, choose those that are relevant, and engage in active reading (Hendricks, 2017). Initially, the teacher-inquirer should skim the resources one by one to quickly determine whether they contain relevant information or not (Hendricks, 2017). Obviously, irrelevant resources should be discarded and the next step is to read in more depth the resources that remain. In the literature several reading skills for deep and engaged reading are reported, such as scanning, surveying, questioning, recalling, reviewing, summarizing, paraphrasing, note-taking, annotating, analysing, evaluating, and critical reading (Blaxter et al., 2008; Booth et al., 2016).

At the same time it is essential that the teacher-inquirer is meticulously recording the bibliographical information of the sources (Bell & Waters, 2014; Blaxter et al., 2008; Booth et al., 2016). Depending on the type of the resource (i.e. books, articles, reports, websites, etc.) different details need to be collected and stored. Conventionally, this information can be kept in a digital file (i.e. spreadsheet or word processor), however the contemporary alternative is to use reference management software (i.e. Zotero, Mendeley, Endnote, etc.).

Exploring

In parallel with searching and reading resources, the teacher-inquirer should be exploring what other people know about the topic. While a preliminary exploration is conducted during the first phase, searching and focusing, during exploring the teacher-

inquirer has to make a more systematic effort to connect with and acquire information from people who have knowledge on the topic and/or can potentially support him/her in the inquiry. Exploring skills are associated, thus, with how the teacher-inquirer connects, engages in dialogue, and asks and receives support from other people. There are two main areas where these skills can be exercised described in the next paragraphs.

To begin with, the teacher-inquirer can connect with colleagues. Breaking professional isolation and seeking out interaction with colleagues is of crucial importance (Brause & Mayher, 1991). Obviously, one can start from the immediate working context, but has to look into the wider educational community also for colleagues with deeper knowledge on the topic at hand. Nowadays, social network sites (i.e. Twitter, LinkedIn, Facebook, etc.), academic and educational networking sites (ResearchGate, Mendeley, Academia, Quora, etc.), and online educational communities (i.e. MirandaNet, MERLOT, UNICollaboration, eTwinning, etc.) have extremely increased the possibilities for establishing such connections (Bell & Waters, 2014).

Another way to connect with people with knowledge on the topic of inquiry is through educational events and courses. Teachers who attend postgraduate programmes can connect with their peers or they can seek out advice from the university professors. Additionally, conferences, workshops, and any educational event, online or face-to-face, related to the topic is a good place to look for people with knowledge on the topic.

4.3.3. Designing and Implementing

Having built knowledge on the topic area, the teacher-inquirer is ready to start the design and implementation of the inquiry. The two processes, design and implementation, are often discussed jointly in the literature since the results from the implementation have an

impact on the subsequent design of the learning activities (Hopkins, 2008; McNiff, 2013; Pelton, 2010; Stringer et al., 2010).

Beyond any doubt, design and implementation are core processes in the inquiry. It is when the teacher-inquirer designs and implements his/her ideas. It is difficult to emphasise more the importance of design and implementation for an inquiry.

During design and implementation the teacher-inquirer exercises a wide range of skills, such as generating ideas, creating and implementing lesson plans, specifying in an operational way the aims of the inquiry, designing data collection and assessment methods, collecting data, writing about the underlying theory of the inquiry, and so on. The following paragraphs analyse in more detail the skills related to designing and implementing.

Designing

While the research questions are framed and refined during focusing, they may need to be specified in an operational way during design. In other words, the teacher-inquirer should decide regarding the research methodology of the inquiry (quantitative, qualitative, or mixed methods) and, subsequently, modify appropriately the research questions. Broadly speaking, depending on the research methodology the research questions might be more or less open-ended and holistic in nature (Creswell, 2014; Mertler, 2017). For specifying in an operational way the research questions, the teacher-inquirer should think about how the research questions can be answered (Hendricks, 2017) and which set of operations or behaviours can be measured, addressed or manipulated (Babbie, 2016; L. Cohen et al., 2007). Next, each general research question should be broken down into concrete questions to which specific answers can be provided (L. Cohen et al., 2007).

While reading the literature and exploring what other practitioners have done in similar situations, the teacher-inquirer should be generating ideas about activities related to

the topic and the research questions. Based on best-practices reviewed in the literature, the teacher-inquirer should create an intervention plan (Hendricks, 2017; Timperley et al., 2014) and formulate well-organized, interesting, and effective lesson plans that can potentially engage students' attention (Stringer et al., 2010).

In parallel with the creation of the intervention plan and the learning activities, the teacher-inquirer should decide on the data collection and assessment methods. Bearing in mind that everything is potential data (Brause & Mayher, 1991), the teacher-inquirer should consider how much time can realistically set aside for data collection (Elliott, 1991) and avoid collecting too much data that will eventually bring a negative impact both on the inquiry and on teaching (Pelton, 2010). Before commencing the design process, it should be ensured that contextual features are taken into account, the best practices have been identified, and any preexisting data collection tools has been located (Pelton, 2010). Hence, the teacher-inquirer should ponder on ways of collecting data that will lead to meaningful, accurate, and appropriate conclusions regarding the research questions and, subsequently, should utilize the appropriate data collection methods (i.e. observational checklists, field notes, questionnaire, interview, teacher-made or standardized tests, student artifacts, school records, teacher journal, student diaries, rating scales, etc.) (Hendricks, 2017; Hopkins, 2008; Mertler, 2017; Pelton, 2010). At this point it is possible that the construction of some or all of the data collection instruments will be required (Pelton, 2010).

The same applies to the assessment methods. The teacher-inquirer should select ways of assessing student performance in relation to the outcomes selected for the inquiry (Stringer et al., 2010). Ideally, the assessment methods should be well linked with the data collection methods.

During this stage the teacher-inquirer should write the theoretical part of the study. While the teacher-inquirer builds knowledge and understanding of the related literature in the previous phase (understanding and exploring), a thorough and critical review of the literature at this point may open up new ways of looking at the topic at hand that might have been overlooked otherwise (Pelton, 2010). Rather than being a summary of what each article is about regarding the topic or an annotated bibliography (Pelton, 2010), the theoretical part of the study should integrate the literature, synthesize it into a series of related topics (often from general topics to narrower ones), and summarize the literature by pointing out the central issues (Creswell, 2014; Hendricks, 2017). By writing a well-woven review the teacher-inquirer will be able to organize his/her thoughts in a better way, design more focused learning activities, and make connections between theory and teaching practice (Pelton, 2010).

Last but not least, the teacher-inquirer should consider any ethical issues that might emerge from the inquiry. First of all, it should be ensured that no harm of any kind is done to the participants in the inquiry and that they are treated with honesty, caring, and fairness (Babbie, 2016; Hendricks, 2017; Mertler, 2017). Hence, for instance, it is not ethical to withhold from some students a teaching strategy that might help them (Pelton, 2010). Second, participants (and if they are underaged their parents as well) should be openly and honestly informed about the aims and processes of the inquiry and they should be given the choice to take part or not in the inquiry without suffering any consequences for their choice (Babbie, 2016; Hendricks, 2017; Mertler, 2017). Third, the participants' identity should be protected when the results of the inquiry are published (Babbie, 2016; Bell & Waters, 2014; Mertler, 2017). Lastly, the teacher-inquirer should prepare and submit an application to the appropriate office or committee for obtaining permission for the study (Babbie, 2016; Bell & Waters, 2014; Hendricks, 2017).

Implementing

At this stage the teacher-inquirer puts into action the research plan. While this might sound as simple and straightforward, it involves practicing several skills and deepening learning on the topic and the situation (Timperley et al., 2014). In addition, as it is already noted, the outcomes of the implementation inform the design of the inquiry, which means that the teacher-inquirer may need to modify or adapt the plans along the way (Elliott, 1991; Kemmis et al., 2014; Pelton, 2010; Timperley et al., 2014).

In general, the learning activities should engage students, acknowledge prior knowledge, and enable students to acquire diverse forms of knowledge (cognitive, affective, psychomotor) (Stringer et al., 2010). Thus, the teacher-inquirer should ensure that these qualities of teaching are met during the inquiry.

Additionally, the teacher-inquirer should be observing and monitoring what happens while implementing the plans (Elliott, 1991; Kemmis et al., 2014; McNiff, 2013; Stringer et al., 2010). The teacher-inquirer needs to constantly observe students' behaviors and gauge the extent to which they are actively involved in the learning activities as well as their performance (Stringer et al., 2010) and keep track of the development of the inquiry and its outcomes in order to be in a position to amend the plans when necessary (Kemmis et al., 2014). Keeping a diary or journal for recording thoughts and actions is often recommended in the literature (Bell & Waters, 2014; Kemmis et al., 2014).

Some actions may need to be planned at this point for the subsequent data collection. Hence, for instance, a pilot may need to be implemented before the actual implementation of the study. A timeline for when inquiry activities will take place may need to be created (Hendricks, 2017) for better monitoring and organization of the inquiry. Additionally, the

interviews may need to be scheduled and/or the participants may need to be selected and contacted.

An important part of the implementation is data gathering. Depending on the decided data collection methods, the teacher-inquirer may need to keep field notes, audio or video record activities, monitor student diaries, conduct interviews, collect data from existing records, and so on (Brause & Mayher, 1991; Hendricks, 2017; Hopkins, 2008; McNiff, 2013; Mertler, 2017).

Lastly, for effective monitoring of the development of the inquiry, interim data analysis may need to be done as well (Baumfield et al., 2013; Brause & Mayher, 1991; Hendricks, 2017; Timperley et al., 2014). Students' artifacts may need to be collected and assessed, while their performance might inform the subsequent design of the learning activities. The teacher-inquirer may need to create tables, graphs, matrices, and charts based on students' outcomes to gain a better understanding of what is going on (Pelton, 2010). If problems or questions arise from interim analysis, data collection strategies may need to be changed (Baumfield et al., 2013; Hendricks, 2017).

4.3.4. Evaluating and Reflecting

Evaluation and reflection are the cornerstones of the inquiry. These two processes, especially reflection, emerge in practically all phases of the inquiry and are major components in almost every action research model (Brause & Mayher, 1991; L. Cohen et al., 2007; Hendricks, 2017; Mertler, 2017). They are highly interdependent as the output of evaluation is the input for reflection while the outcomes of reflection have an impact to subsequent evaluation processes.

While evaluating and reflecting skills are exercised throughout the inquiry and not only at this phase, at the end of the study they become central as the teacher-inquirer has to

review the process and the outcomes of the inquiry. The next paragraphs analyse the evaluating and reflecting skills practiced at this phase of the inquiry.

Evaluating

The process of evaluation begins with the analysis of the collected data. Depending on the type of data (quantitative or qualitative), different analysis procedures are followed. The use of both quantitative and qualitative data is frequently recommended in the literature for strengthening the validity and credibility of the inquiry (Creswell, 2014), therefore the teacher-inquirer should try to build skills in both quantitative and qualitative analysis. In addition, since data analysis nowadays is assisted by specialized computer software (Hendricks, 2017; Mertler, 2017), the teacher-inquirer should learn how to use these programmes effectively and efficiently. In general, the data should be interpreted based on the specific aims and questions that guide the inquiry as well as the underlying theory and/or established criteria (Brause & Mayher, 1991; Hopkins, 2008), and in the next stage connections between the results and the literature should be drawn (Brause & Mayher, 1991).

The results of the analysis will help the teacher-inquirer to evaluate the extent to which the inquiry achieved its initial purpose (Timperley et al., 2014). Undoubtedly, evaluation is an integral part of educational life as teachers regularly check students' performance and understanding before proceeding to new topics (Stringer et al., 2010). Therefore, it could be argued that teachers are already quite skilled in conducting evaluation. Nevertheless, an inquiry calls for a reconsideration of the whole assessment process. Instead of being a final stage of judgement and accountability, it should be an integral part of learning (Stringer et al., 2010) allowing and encouraging students to take part in its design and its results can be used for improving future performance (Carless, 2007).

Lastly, other aspects of the inquiry may need to be evaluated. For instance, the design and implementation of the lesson plans, the assessment process, and the data collection methods. While these aspects are often neglected, the teacher-inquirer should keep in mind that the way the lesson is designed and implemented have a significant impact on students' learning (Biggs, 2003). The same applies to the design and implementation of the assessment process (Boud, 2000; Carless, 2007). In a similar way, the data collection methods and the type of data that are collected determine the outcomes of the inquiry.

Reflecting

Reflection is ignited and nurtured during the evaluation process. While evaluating the process and the outcomes of the inquiry, the teacher-inquirer builds a deeper understanding and discovers more about what really happened in relation to the inquiry aims and questions (Kemmis et al., 2014). Bringing to the mind the whole inquiry paves the ground to consider issues such as what went according to the design, what proved to be easier or more difficult than expected, what was surprising or predictable (Baumfield et al., 2013), and think about unanticipated, unintended, and side effects (Kemmis et al., 2014). Additionally, the teacher inquirer has the opportunity to review the achievements and limitations of the inquiry and reconsider the opportunities and constraints of the context (Kemmis et al., 2014).

In parallel, the teacher-inquirer reflects on the experience of conducting inquiry and examines personal practice (Pelton, 2010). It is an opportunity to learn from the experience and critically examine the choices made during the inquiry, ponder on personal strengths and weaknesses, and consider alternative routes of action for the future (Mertler, 2017).

Lastly, the teacher-inquirer can support the reflection process by seeking discussions with other people (i.e. colleagues, supervisor, academics, etc.) over the inquiry and its outcomes (Kemmis et al., 2014; Mertler, 2017; Pelton, 2010). Discussing the inquiry study

with others helps to bring to the mind important details that might have slipped otherwise, acquire a better understanding of the important parts and outcomes of the study, and critically examine personal practice.

4.3.5. Writing and Presenting

Dissemination of the findings is an important part of the inquiry process (Hendricks, 2017; Hopkins, 2008; Mertler, 2017; Pelton, 2010). Unquestionably, there are many ways for the dissemination of the findings, especially nowadays with the prevalence of social media in all aspects of life, yet, still the two most common ways is through writing and publishing a text and through creating and delivering a presentation.

Depending on the intended audience, the teacher-inquirer can prepare different types of texts and presentations, from informal texts for social network sites and presentations for colleagues at work to academic articles and conference presentations.

Therefore, in the last phase of the inquiry three main types of skills are exercised: writing, presentation creating, and presenting skills. The paragraphs that follow analyse in more detail these skills.

Writing

Before commencing writing the teacher-inquirer has to consider the purpose, the voice, and the intended audience in order to choose the most effective and appropriate format and style for the occasion (Babbie, 2016; Baumfield et al., 2013; Hopkins, 2008; McAteer, 2013; Mertler, 2017). In any case, it should be kept in mind that the audience does not have personal knowledge of the study or the results (Pelton, 2010), and, in most occasions, of the context of the study. Therefore, the document should provide essential information about the study so that anyone can understand what happened and why. Lastly, word or space

limitations determine the level of detail in reporting the inquiry and its outcomes (Babbie, 2016; Hopkins, 2008).

In addition, the teacher-inquirer should be able to organize and write appropriately the different parts of the document (Babbie, 2016; Booth et al., 2016). Each part of an academic paper serves a different purpose and calls for different writing skills and style (Babbie, 2016; Booth et al., 2016; Pelton, 2010). Overall, arguments should be communicated clearly and supported by evidence (Booth et al., 2016). While corroborating arguments with selected resources, the teacher-inquirer should be able to summarise, paraphrase, and quote other authors' ideas appropriately and avoid any instances of plagiarism (Babbie, 2016; Booth et al., 2016). Of course, a citation format should be used consistently throughout the document (Pelton, 2010).

When writing the document the teacher-inquirer exercises reflecting and evaluating skills (Booth et al., 2016; Hopkins, 2008; Pelton, 2010). Writing is a very complex cognitive task that requires to simultaneously juggle ideas, content, structure, genre, language norms (syntax, grammar, etc.), while also considering the voice, audience, and document purpose. Therefore, the teacher-inquirer has to regularly self-evaluate the document, revise the arguments and evaluate their quality, reflect on whether the document achieve its purpose, and so on (Booth et al., 2016; Hopkins, 2008; Pelton, 2010).

Lastly, the teacher-inquirer should try to get feedback on the document in order to check its quality. Thus, before submitting the document for publication or examination it is recommended to send the draft to others (academics, peers, colleagues) and kindly request feedback (Booth et al., 2016).

Presenting

Creating a presentation requires similar skills to writing. Hence, before starting the development of the presentation, the teacher-inquirer has to consider the purpose, the voice, and the intended audience for selecting the most effective and appropriate format and style for the occasion (Babbie, 2016; Baumfield et al., 2013; Hopkins, 2008; McAteer, 2013; Mertler, 2017). Same as in writing, during the development of the presentation reflecting and evaluating skills are exercised as the teacher-inquirer is engaged in a constant process of reviewing and refining the presentation.

In addition, for constructing an effective presentation the use of visual aids is recommended (Booth et al., 2016; Mertler, 2017; Pelton, 2010). Hence, the teacher-inquirer should be able to carefully select the most effective graphic (i.e. table, chart, etc.) for presenting the data (Booth et al., 2016; Pelton, 2010). Needless to say that it is necessary to refrain from making the presentation look cluttered (Pelton, 2010) or selecting fancy graphics that obscure the message (Booth et al., 2016). As a general rule, the graphics should be kept as simple as their content allows (Booth et al., 2016).

Besides the skills required for developing the presentation file, presentation skills are required for delivering the presentation. The teacher-inquirer should be able to attract the attention of the audience from the beginning and keep the audience actively engaged with the presentation until the end. Rehearsing the presentation before the delivery is absolutely necessary for improving presentation skills and eventually delivering a rousing presentation.

4.4. Agency, Sense-making, Ownership, and Emotions

In this section, four identified components, agency, sense-making, ownership, and emotions that are part of the teacher-inquirer identity are discussed. Agency, sense-making, and ownership are interrelated and overlap, while they are inextricably interwoven with

emotions. Thus, when teachers experience high or moderate degree of *agency*, the innovation *makes sense* (can be fitted or adapted) to the existing teacher identities, and teachers develop increased levels of *ownership* towards the innovation, whereas when teachers experience low degree of *agency* the innovation does not *make sense* to the existing teacher identities, and teachers experience moderate or low degree of *ownership* (Ketelaar et al., 2013). Emotions are embedded in teacher practices and shape how teachers perceive agency, make sense, and feel ownership of the innovation.

In the following sections it is analysed how these components affect the teacher-inquirer identity as well as other teacher identities when teachers are engaged in professional development opportunities such as during an educational innovation or while conducting a thesis.

4.4.1. Agency

Teacher agency is an elusive construct which acquires mainly three different conceptualizations in the literature: teacher agency as personal attribute, teacher agency as capacity, and teacher agency as phenomenon/action (Simpson et al., 2018; Tao & Gao, 2017). When agency is approached as an innate attribute or personal capacity the contribution of the social environment to the development of agency is usually neglected. On the contrary, when teacher agency is approached as a phenomenon/action the interplay of individual efforts and the ecological conditions through which teacher agency is enacted is highlighted (Biesta & Tedder, 2007; Eteläpelto et al., 2013; Priestley et al., 2015). In this approach teacher agency is conceptualised as something that has to be achieved in and through engagement with concrete contexts-for-action based on teachers' beliefs and own goals. To put it simply, teacher agency is not something that teachers *have*, it is something that teachers *do* in accordance with their beliefs and goals. The achievement of teacher agency is always informed by the past experiences of a teacher, it is orientated towards the future (what the

teacher wants to achieve), and it is enacted in a concrete situation that both constraints and supports teacher agency with the available discursive, material, and relational resources (Priestley et al., 2015).

Teacher agency is used as a concept to explain the active efforts of teachers in spite of continuing contextual disparities to make choices and take intentional action in order to stay true to their beliefs and reach their goals. Although teacher agency is especially practiced and manifested when teachers undertake creative initiatives and when they renegotiate their teacher identities due to a change in the working context (Eteläpelto et al., 2013), it is also noticeable in more ordinary settings. Hence, the *teacher as subject matter expert* may show empathy towards students when they make mistakes and encourage them to keep trying (Kayi-Aydar, 2015), the *teacher as didactical expert* may select the appropriate teaching approach depending on the content that has to be learnt (Lai et al., 2016), the *teacher as pedagogical expert* may establish personalized interactions with the students to help them realize the benefits of school (Naraian & Schlessinger, 2018), the *teacher as professional* may carefully interact with external professionals to ensure both sustainability of the collaboration and students' learning (Vähäsantanen et al., 2009), the *teacher as learner* may actively engage in deep learning towards practice improvement (Charteris & Smardon, 2015; Flint et al., 2011), and, lastly, the *teacher as political being* may take action to improve students' and their families' well-being (Ebersöhn & Loots, 2017).

When an educational innovation or reform takes place teachers may need to renegotiate their identities in order to adjust their teaching practices and working routines according to the innovation or reform. When a reform is designed and imposed on a top-down basis, it most often than not constrains the possibilities of change emerging from teachers' own experiences, while the overall implications for teachers is negative (Lasky, 2005; Vähäsantanen, 2015). In such cases teachers perceive weak agency concerning their

work at the organizational level, yet, despite this, teachers may still experience strong agency in their work at the classroom level (Lasky, 2005; Priestley et al., 2012; Vähäsantanen, 2015). In contrast, when a reform is not imposed in a firmly top-down fashion, teachers regularly achieve strong agency (Oolbakkink-Marchand et al., 2017; Vähäsantanen et al., 2008).

It appears that the intensity of teacher agency is closely related to the extent to which teachers are committed to their identities (Tao & Gao, 2017) as well as with the support and trust teachers receive from the school management (Oolbakkink-Marchand et al., 2017). Teachers' agency can vary from 'reserved' (expressing resistant positions towards the reform and performing the minimum activities required by the reform) to 'progressive' (approving of the reform and engaging actively and innovatively with the reform) (Vähäsantanen, 2015). Lastly, it seems that teachers with a progressive agency tend to attribute the successes and failures with an innovation to themselves, while teachers with more reserved agency to external factors (Marshall & Drummond, 2006).

4.4.2. Sense-making

The concept of sense-making is based upon the theoretical framework of symbolic interactionism which posits that individuals act based on the meanings objects (an object can be anything from material goods to ideas and experiences) have for them and the way they define and interpret situations, while these meanings arise in social interaction and are continuously created and recreated (Dennis & Smith, 2015). Thus, the idea that objects have fixed and immutable meanings intrinsic to them is rejected, while the process of making sense of an object occurs through the use of existing knowledge structures of the individual, interaction with other people, and interpretation of the social context.

When teachers are confronted with an educational innovation or reform, they make efforts to make sense of it based on their own knowledge, beliefs, and experiences, the

interactions they have with their colleagues about it, and their interpretation of the policy message for the implementation of the innovation or reform as well as of the situation in which they find themselves (Lopes, 2002; Luttenberg et al., 2013).

Far from being straightforward, the process of sense-making is affected by several factors related to the individual (e.g., misinterpretation of the reform, misunderstanding of new ideas as familiar, focus on superficial factors and miss deeper relationships, biases, etc.), the social context (e.g., shared beliefs and practices of a community/organization, social interactions, emotions, organizational arrangements, informal communities, etc.) as well as the design and communication of the policy (e.g. top-down implementation, informed dialogue, teacher training, etc.), which can have positive and negative effects on how a teacher is making sense of the innovation or reform (Davies et al., 2009; Rom & Eyal, 2019; Schmidt & Datnow, 2005; Spillane et al., 2002).

For examining teacher sense-making two dimensions of attunement can be distinguished according to Luttenberg et al. (2013). The first dimension is related to the extent to which a teacher's identity corresponds to the situational demands of the innovation. The second dimension is related to the extent to which one's teacher identity or the teacher identity required by the innovation predominates in a given situation.

When combined, the two dimensions produce four possible types of sense-making: assimilation, accommodation, toleration and distantiation (Luttenberg et al., 2013).

Assimilation is the adaptation of the new ideas regarding teacher's role, practices, and so on, in such a way that they fit into the existing teacher identities. The outcome of assimilation is a variant of one's teacher identity rather than a changed teacher identity. Accommodation is the adaptation of one's teacher identities to fit into the perceived teacher's role required by the reform. The situational demands are predominant and the outcome is an interpretation and

handling of situations that is largely in keeping with the required rather than one's own teacher identity. Toleration is the acceptance of the new ideas in addition to or at the cost of one's teacher identity. Although there is a mismatch between the new ideas about teacher's role and practices and the teacher's existing identities, the teacher adheres to his/her existing identities while allowing the new roles and practices to predominate. The result is the coexistence of antagonistic ideas about teacher's role and practices within one's teacher identities. Distantiation is the rejection of the new ideas proposed by the reform and maintenance of the existing identities. The outcome of distantiation is maintenance of one's teacher identities almost unmoved, while the new ideas about teacher's role and practices have little or no influence. Different combinations of the four types of sense-making can be found within one teacher during the implementation of an educational innovation or reform (Luttenberg et al., 2013).

4.4.3. Ownership

The feelings of ownership are related to the extent to which a teacher senses that an educational process (i.e. teaching, studying, educational innovation or reform) (Melville, 2008) or resource (i.e. curriculum, student data) (Huffman & Kalnin, 2003; Kirk & MacDonald, 2001) belongs to himself/herself (Berrill & Whalen, 2007) rather than imposed or controlled by authorities (Dyer, 1996; Jessop & Penny, 1998). The target of ownership can range from physical objects (i.e., books, classroom) and the school as an organization to groups and people (i.e. students, colleagues), while it can also target processes, ideas, and knowledge (Baan et al., 2020; Pirkkalainen et al., 2018). It has been found that perceptions of ownership in relation to the teaching approach promoted the engagement with inquiry-based working (Baan et al., 2020).

Teachers' feelings of ownership towards an educational innovation or reform is often mentioned as crucial for its acceptance, success, and sustainability (Ketelaar et al., 2013;

Koster & Dengerink, 2008; Melville, 2008). When teachers do not feel that they have ownership of the process and product of the innovation, they are not willing to engage with it (Berrill & Whalen, 2007).

Teachers experience ownership when they have an active part in the development of the innovation and when their beliefs are in alignment with the values and ideas promoted by the innovation. In other words, when teachers support the ideas of the innovation and feel that the innovation is important for them and the students their sense of ownership towards the innovation is high (Ketelaar et al., 2014). In such conditions, the innovation is neatly, and sometimes effortlessly, integrated into teachers' practices, while teachers feel that the new teacher identity that they are required to adopt is one that suits better in their pre-existing teacher identities and it is more familiar to them compared to the traditional identity of the teacher (Ketelaar et al., 2012). Consequently, teachers are inclined to devote time and energy in the innovation which, in return, strengthens their commitment to the new teacher identity and feelings of ownership towards the innovation. The new identity is manifested in the teacher's relationship with others as the teacher who experiences high degree of ownership towards the innovation is more inclined to communicate about it with his/her colleagues (Ketelaar et al., 2012, 2014).

4.4.4. Emotions

Although emotions are an inextricable aspect of daily life and the learning process in particular, the study of emotions in education has been considered problematic for a variety of reasons which deterred researchers until recently (Chen, 2016; Cross & Hong, 2012; Zembylas, 2007). Undoubtedly emotions are elusive and the definition of what is meant by emotions is far from being straightforward, while in the literature appear three different theoretical assumptions regarding the nature of emotions: emotions as an individual

experience, emotions as a sociocultural experience, and emotions as interactional and performative (Zembylas, 2007).

The entirety of empirical studies on teachers' emotions asserts the significance of emotions for teachers' identities (Uitto et al., 2015). Hence, for instance, *teacher as pedagogical expert* forms intimate, emotionally laden relationship with students (Cowie, 2011; Cross & Hong, 2012); *teacher as subject matter expert* may feel excited and passionate about the subject matter (Loh & Liew, 2016; Zembylas, 2007) and get stressed about grading student essays (Loh & Liew, 2016); *teacher as didactical expert* may experience successes and failures in organizing a project (Zembylas, 2004) and participate in teachers' networks to find emotional support about teaching issues (Cowie, 2011); *teacher as learner* may experience pleasant emotions in professional development opportunities which promote engagement and reflection, or contrarily unpleasant emotions which lead to disengagement (Gaines et al., 2019); *teacher as professional* may be passionate about the school and improving students' achievement (Day & Leitch, 2001) or, contrarily, may experience resentment because of the diminishing quality of the teachers' professional lives (Day & Leitch, 2001) and colleagues' disinterest in teaching or professional growth (Cowie, 2011; Cross & Hong, 2012); *teacher as political being* may be emotionally drained and may take action when students confide family violence incidents (Day & Leitch, 2001) or when obnoxious events, such as theft, arise in the classroom (Cross & Hong, 2012).

In light of an educational reform there are multiple factors that affect the intensity and emergence of specific emotions, both positive and negative, and the way these affect teacher identities.

To begin with, age and career stage have an impact on how teachers will feel towards the reform and how they will adapt to it: early career teachers tend to be energetic and

enthusiastic and are adaptable and flexible though they are less comfortable with their role as teachers and feel uncertainty about their future, mid-career teachers are more relaxed and comfortable about their role but still adaptable and flexible enough, and, lastly, late-career teachers are skeptical towards reforms as well as are more tired and emotionally drained (Hargreaves, 2005; Snyder, 2017).

Second, the process of meaning-making of a reform is emotionally laden and when the teachers are not supported in understanding and implementing the reform (i.e. with resources and training) both positive and negative feelings about the reform will probably arise as teachers are required to alter their roles (Schmidt & Datnow, 2005; van Veen et al., 2005).

Third, teachers' emotions to reforms reflect the fact that teachers' responses have a profoundly political and professional dimension as a different set of beliefs about teaching, learning, and the teacher role is required to be adapted (Kelchtermans, 2005; Lasky, 2005; van Veen et al., 2005).

Fourth, teachers often implement the reforms against their beliefs about teaching and what is good for their students, which creates conflicts in their identities and feelings of anger, anxiety, and guilt (Lasky, 2005; Schmidt & Datnow, 2005; van Veen et al., 2005).

Lastly, if teachers are substantially supported during the implementation of the reform and see the value of it, initial negative emotions can be turned into excitement and pride accompanied also with drastic changes in their teacher identities (Darby, 2008).

4.5. Synopsis

The conceptualization of the teacher as inquirer dates to at least the beginnings of the 19th century while nowadays is one of the most influential paradigms for teacher education models.

The scope of this chapter was to define the teacher-inquirer identity, construct a theoretical model regarding the inquiry skills that are developed during inquiry, and examine four elements of teacher identity that are particularly triggered during professional development, that is agency, sense-making, ownership, and emotions.

Drawing from literature on action research and research in social sciences a definition of the teacher-inquirer is constructed as *the teacher who identifies an important educational situation that should be studied or improved, explores related resources to build understanding, plans and implements an inquiry project, evaluates the outcomes of the project and reflects on it, and, finally, shares the project outcomes with the community.*

Our conceptualisation of the inquiry skills that comprise the teacher-inquirer identity is inspired by processes that teachers follow while conducting action research and research in social sciences.

From the literature review five different phases or skills of inquiry are identified: searching and focusing, understanding and exploring, designing and implementing, evaluating and reflecting, writing and presenting. These skills are summarized in the following paragraphs.

Searching skills are important for searching for potential problems or issues to inquire. The searching skills allow the teacher-inquirer to examine issues in students' learning, in his/her own teaching practice, in curricular decisions, and so on.

Focusing skills are needed for identifying a topic for inquiry from the several potential ones and directing all his/her energy and attention on it. During focusing, the teacher-inquirer exercises skills related to reducing a list of topics, refining the topic, formulating research questions, critical thinking, reflection, evaluation of the potential of the topic, and so on.

Understanding skills are essential for building knowledge on the selected topic. The teacher-inquirer should be able to conduct a systematic search to identify related literature, evaluate its quality, and engage in active reading. During reading several skills are practiced, such as skimming, scanning, surveying, summarizing, recording bibliographical information, and so on.

Exploring skills are necessary for interacting and connecting with people who have expertise in the topic area. Exploring skills are associated, thus, with how the teacher-inquirer connects, engages in dialogue, and asks and receives support from other people. In general, the teacher-inquirer can exercise exploring skills by connecting online or communicating face to face with colleagues and scholars as well as through educational events and courses.

Designing skills are core for the inquiry. These skills related to the specification of the research questions in an operational way, generating ideas, designing data collection and assessment methods, considering ethical issues, writing about the underlying theory of the inquiry, and so on.

Implementing skills are core for the inquiry as well for they are related to putting into action the research plan. Therefore, these skills are related to engaging students' attention and interest, delivering a lesson that enable students to acquire diverse forms of knowledge, and monitoring and observing students' learning. In addition, during the implementation data gathering skills are needed, such as keeping notes of students' performance, recording

activities, and conducting interviews, while some planning of the data gathering activities may be required as well. Lastly, data analysis skills are required during implementation for effective monitoring of the development of the study.

Evaluating skills are the cornerstones of the inquiry for they are required in practically all phases of the study. Evaluating skills are related to skills in data analysis, using specialized software for data analysis, evaluating the results of the inquiry as well as evaluating outcomes that were not planned or anticipated.

Reflecting skills bear the same importance with evaluating skills. Reflecting skills are exercised throughout the inquiry as well as at the end of the study after the evaluation of the results and when the teacher-inquirer is reflecting on his/her personal experience. Reflection is also nurtured in discussions with other people about the results of the inquiry.

Writing skills are important for the dissemination of the results. For writing an effective document the teacher-inquirer has to consider the purpose, the voice, the intended audience, and the word/space limitations in order to organize and write appropriately the different parts of the document. Overall, writing is a complex cognitive activity and several skills are required for communicating ideas clearly and convincingly, while avoiding issues with plagiarism and improper referencing of supporting material. Evaluating and reflecting skills play a crucial role during writing. Requesting feedback on the draft from others facilitate the evaluation of the document.

Presentation creating and presenting skills are exercised for delivering a presentation. In general, creating a presentation requires similar skills to writing. In addition, integrating appropriate and effective graphics (i.e. tables, charts, etc.) that communicate the message clearly and concisely is necessary. Presentation skills are needed for attracting and

maintaining the audience attention. Rehearsing the presentation before the delivery is key for improving presentation skills.

Lastly, it is explicated how agency, sense-making, ownership, and emotions affect the teacher-inquirer identity when the teacher is engaged in professional development opportunities.

Teacher agency is not something that teachers *have*, it is something that teachers *do* in accordance with their beliefs and goals. The way an educational innovation or reform is designed (i.e. top-down vs bottom-up) affects how teachers perceive agency and subsequently how they renegotiate their identities in order to adjust their teaching practices and working routines according to the innovation.

The process through which teachers make sense of an educational innovation is affected by factors related to the individual, the social context, and the design of the policy. When teachers are confronted with an educational innovation four possible types of sense-making can occur: assimilation (adaptation of the new ideas regarding teacher's role, practices, and so on, in such a way that they fit into the existing teacher identities), accommodation (adaptation of one's teacher identities to fit into the perceived teacher's role required by the reform), toleration (acceptance of the new ideas in addition to or at the cost of one's teacher identity), and distantiation (rejection of the new ideas proposed by the innovation and maintenance of the existing teacher identities).

The feelings of ownership are related to the extent to which a teacher senses that an educational innovation belongs to himself/herself rather than imposed or controlled by authorities. Teachers experience ownership when they have an active part in the development of the innovation and when their beliefs are in alignment with the values and ideas promoted by the innovation. In such conditions, teachers feel that the new teacher identity that they are

required to adopt is one that suits better in their pre-existing teacher identities and it is more familiar to them compared to the traditional identity of the teacher. The new identity is manifested in the teacher's relationship with others as the teacher who experiences high degree of ownership towards the innovation is more inclined to communicate about it.

The whole body of empirical research on teachers' emotions asserts the significance of emotions for teachers' identities. In light of an educational reform there are multiple factors, including age, career stage, support in meaning-making, and underlying beliefs, that affect the intensity and emergence of specific emotions, both positive and negative, and the way these affect teacher identities.

5. Research Methodology

5.1. Introduction

This chapter discusses topics and issues related to the research methodology of the thesis. It begins with an analysis of theoretical issues regarding how knowledge is viewed and acquired and then moves to the particular research methodology, questionnaire design, sampling methods, and ethical considerations of the research design of this study. After that, the criteria utilized for the Principal Component Analysis (PCA) as well as the PCA process are outlined. Finally, the data analysis methods and process are explained and the chapter concludes with a synopsis of the research methodology of the thesis.

5.2. Research Design

5.2.1. View of Knowledge: Critical Realism

The research study is situated within the critical realism paradigm. In the following paragraphs the core axioms and assumptions of critical realism are presented as these are analysed in the work of the philosopher and founder of critical realism, Roy Bhaskar (2005/1979, 2013/1975).

Critical realism is based on three core axioms: ontological realism, epistemological relativism, and judgmental rationalism. The first posits that the world exists independent of what we know or think about it, the second that we construe the world we live within and reflect upon and talk about, and, third, that in light of the previous two axioms we are able to weigh up truths and likelihoods. To put it more simply, while it does matter what we think about reality, the reality is in large part mind-independent. In addition, our thinking and understanding of the world are socially contingent, which means that they may change over time and vary from place to place. Lastly, based on what is known as true, we are able to make judgements over claims and statements, which also means that our judgements are both enabled and constrained by the social context.

The ontological conceptualization of critical realism discerns three levels of reality. The empirical level is about what we experience through our senses, the actual level is about what happens regardless of our engagement with it, and the causal level is about the underlying mechanisms that work synergistically to produce distinct effects in the empirical and actual levels of reality. To illustrate the difference among the three levels we can consider the example of a teacher who conducts an inquiry. This is an actual event regardless of whether others are able to observe the teacher while conducting inquiry or the outcomes of the inquiry. The empirical level deals with how the individual teacher perceives the inquiry. Undoubtedly, each teacher may experience the process of inquiry in different ways. Lastly, the underlying motives or beliefs for conducting inquiry or teachers' inquiry skills cannot be easily observed, yet they have a crucial impact on how the inquiry is conducted; this is the causal level.

5.2.2. How Knowledge is Acquired: Deductive Reasoning

The research study adheres to deductive reasoning for testing and validating the theoretical model of the teacher-inquirer identity. The basic phases of the procedure are described in the following paragraph.

Initially, the teacher-inquirer identity model was constructed by reviewing the relevant literature (see Chapters 2, 3, and 4). In the following phase the major concepts were identified, that is the inquiry skills and the components of the teacher-inquirer identity. Next, the range of phenomena that the theoretical model addresses was determined. Hence, it was decided to focus on teachers who conduct inquiry in their classroom in light of an educational innovation and on student-teachers who conduct inquiry as part of their master studies. Following that, the concepts of the model were adapted to accommodate the specified contexts of the classroom during an educational innovation and the inquiry during a master thesis. Lastly, the concepts were operationalized into question items. The responses to the

question items provided information with reference to the extent to which the expected pattern actually occurred. Subsequently, based on the survey outcomes the validity of the model was evaluated and conclusions were drawn as regards the teacher-inquirer identity.

5.2.3. Methodology: Online Quantitative Survey Research

Online quantitative survey research is the methodology utilised in this thesis. There are four main reasons for the selection of online quantitative survey research. First, survey research is probably the best method for collecting original data regarding a population that is very large to observe directly (Babbie, 2016). Second, online survey research takes advantage of the internet to provide access to unique populations (Wright, 2006). This was particularly important for this thesis since the populations targeted were difficult if not impossible to reach through other channels. Third, online survey research is a highly efficient method in terms of time and cost and can be administered remotely (Wright, 2006). Lastly, surveys can be repeated in different settings and thus afford comparisons among different populations (Blaxter et al., 2008).

5.2.4. Questionnaire Design

There are several guidelines, recommendations, and tips in the literature concerning questionnaire design (Babbie, 2016; Bell & Waters, 2014; Blaxter et al., 2008; Robson, 2002). The paragraphs that follow list the most important topics and issues that were considered for the design of the questionnaires accompanied with examples where it is deemed necessary.

Layout

The appearance of the questionnaires was carefully examined from the first page to the last towards achieving a simple, consistent, and uncluttered layout. Thus, font styles and colors were used consistently so as to enhance the readability and structure of the

questionnaires. In addition, the questionnaires were adequately spaced and the background color was neutral to facilitate reading. Lastly, questions were assembled into matrices for efficient use of space and easier responding.

Instructions

The questionnaires contained clear instructions and introductory comments where it was appropriate. Hence, the first page informed the participants about the purpose of the research, the number of questions, and the estimated time for completion. Moreover, each new subsection was introduced with a short statement concerning its content and purpose. Instructions and explanations make the questionnaire seem less chaotic and help the respondents to make sense of the questionnaire and enter into the proper frame of mind for answering the questions (Babbie, 2016).

Question Wording

The questions were meticulously examined for clarity, precision, bias, and assumptions. Therefore, simple language was used with consistent terminology, while jargon and imprecise words were avoided as much as possible in order to ensure that all respondents understand and interpret the questions in the same way. Additionally, it was confirmed that the questionnaire did not contain any double-barreled question and that all questions asked about one concept. Because the questionnaire asked respondents about things they did in the past, the reference period (last three years) was made explicit. The questions were examined for assumptions and leading language to make certain that the phrasing or particular words were not potentially perplexing for the respondents neither led them to answer in a certain way.

5.2.5. Sampling Methods

Survey: Teachers' Perspectives Regarding Inquiry

Two sampling methods were employed for selecting the participants. Judgmental sampling was used to identify and select participants on the basis of their characteristics and the objectives of the study. Because it is difficult to find teachers who conduct inquiry and are willing to respond to questionnaires, snowball sampling was also used for finding potential participants.

Survey: Student-teachers' Perspectives Regarding Inquiry

Judgmental sampling was used for selecting the participants. Three online postgraduate programmes offered by the UOC were selected on the basis of their relevance with the education field. The link to the survey was sent to all students who just completed the TFM module (master thesis project).

5.2.6. Ethical Considerations

The research study adhered to a series of principles and measures with reference to ethical issues and obtained ethical clearance from the UOC Ethics Committee. Due to the nature of the research (adult respondents, uncontroversial and non-sensitive topics, no contact between the respondent and the researcher, few personal data requested) no substantial risks for the respondents were identified.

Respondents were informed that their participation is voluntarily and that they could withdraw anytime without giving any explanation and without having any negative consequence. An informational document about the research study was shared and respondents were required to provide their consent to participate before accessing the survey questions.

Respondents were also informed that their data will be held confidential, secure, and anonymous. Although individual identification is nearly impossible from the collected data, any data that might relate individuals to particular records was removed (i.e. project descriptions were codified) before publication, while personal identifiers (email address) were removed before analysis. All the data from the questionnaires are securely held in a password-protected digital repository.

5.3. PCA

PCA is utilized to reveal the underlying structure and extract the main components from each instrument. There is a long ongoing debate on whether PCA or factor analysis should be preferred when a researcher wants to find a smaller number of entities that account for most of the variation, although PCA and factor analysis often produce similar results (J. D. Brown, 2009b; Costello & Osborne, 2005; Pallant, 2011; Pituch & Stevens, 2016).

The following paragraph outlines the procedure followed for conducting the PCA, and after that, the guiding criteria are listed and briefly described.

5.3.1. Procedure

In this study, PCA is implemented in three stages. First, it is evaluated whether the data set is suitable for PCA by calculating the Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. Second, the number of factors that should be retained is determined by applying several criteria and by experimenting with a different number of factors and different rotation methods when it was considered necessary. Third, the internal consistency of the resulting instrument is confirmed by calculating the Cronbach alpha.

5.3.2. *Criteria*

The most challenging decision in PCA is to determine the number of factors that should be retained. While there are several criteria and rules of thumb that assist researchers in their decisions more often than not different criteria produce conflicting outcomes, therefore the researcher's role in interpreting the outcomes and determining the factors is essential. Since each criterion examines the issue from a different perspective and have certain strength and limitations, the use of multiple criteria is generally advised. Below the most important criteria are listed (J. D. Brown, 2009a; Pallant, 2011; Pituch & Stevens, 2016):

- Bartlett's test of sphericity: The test should be significant ($p < .05$) for the factor analysis to be considered appropriate.
- KMO: The minimum suggested value for a good factor analysis is 0.6.
- Kaiser criterion: Only factors with an eigenvalue of at least 1.0 should be retained for further investigation.
- Scree plot: Factors in the sharp descent before the first one on the line where they start to level off should be retained for further investigation.
- Sample size and communalities: With sample sizes around 100 good estimates can be obtained when the average communality is 0.70 and there are at least three substantial loadings per factor (Fabrigar & Wegener, 2012, as cited in Pituch & Stevens, 2016).
- Trivial, unstable, and solid factors: Factors that do not have at least two items above 0.30 are considered trivial, factors with fewer than three items are considered weak and unstable, whereas five or more strongly loading items (over .50) are desirable and indicate a solid factor.

- **Loadings:** First of all, when an orthogonal rotation is used interpretations are based on the structure coefficients, whereas when using an oblique rotation, interpretations should be based on pattern coefficients. Three threshold values are proposed: |0.32|, |0.40|, and |0.50|. For structure coefficients these values would imply that an observed variable corresponds to approximately 10%, 15%, and 25% variance explained accordingly. An item that loads at 0.32 or higher on two or more factors is called ‘crossloading item’ and may need to be dropped from the analysis, especially when there are several adequate loaders (over 0.50) on each factor.
- **Rotation method:** Oblique rotations are preferred since correlated factors are much more reasonable to assume in most cases. However, when it is difficult to interpret the solution, both orthogonally and obliquely rotations should be applied.
- **Maximize variance:** The amount of cumulative variance produced by each solution should be monitored and the higher possible value should be preferred.
- **Cronbach’s α :** The Cronbach’s α coefficient should be 0.7 or higher.
- **Factor meaningfulness:** Perhaps this is the most important criterion since the other criteria are generally mathematical and they may not always produce meaningful or interpretable factors. The researcher ultimately decides if a factor solution is worthwhile.

5.4. Data Analysis

Data was analyzed using SPSS v24.0. Different statistical analysis methods and tests were used for addressing the research questions. These are outlined in the next paragraphs accompanied with a brief description of when and how they were used.

5.4.1. Group Comparison

For comparing groups (i.e. different clusters of teachers) the non-parametric Mann-Whitney U-test was used. A non-parametric test was preferred over the parametric equivalent (t-test) since the assumption of data normality was usually violated (some clusters had less than 30 items).

When the difference was marked statistically significant, eta squared (represented as η^2) was calculated (Hatch & Lazaraton, 1994, p. 279):

$$\eta^2 = Z^2/(N-1)$$

Eta squared shows the strength of the association, that is the percentage of variance that may be attributed to the independent variable. While this measure is also a way to interpret the outcomes, since, obviously, the higher its value the more the independent variable is accountable for the variability, yet, it was rarely used as such because there was an increased number of associations and the outcome would be complicated. Instead, Cohen's guidelines were adopted which set outcomes of 0.01, 0.06, and 0.14 to indicate a small, medium and large effect correspondingly (J. Cohen, 1988, pp. 285–287).

5.4.2. Correlation

Bivariate correlation was conducted between variables to explore possible relationships. Statistical significance was estimated at two levels of alpha: 0.05 and 0.01. In order to avoid inflated type I errors, Bonferroni correction was applied in the alpha levels.

For interpreting the outcomes, the coefficient of determination was calculated, which demonstrates the percentage of shared variance between the variables, that is the percentage of overlapping (Pallant, 2011).

5.4.3. Clustering

A hierarchical cluster analysis (HCA) was conducted to classify cases using Ward's method and the Squared Euclidean Distance measure. The Ward's method was chosen because it constitutes clusters that are prototypically types, which meets the concept of a cluster in this research. Additionally, the data was checked and no outliers were found. The Square Euclidian Distance measure was chosen because it is appropriate for interval data and the Ward's Method.

The number of clusters was determined through five different methods. First, the dendrogram was examined to find areas where no merger has occurred for a long distance (Sarstedt & Mooi, 2019). Second, a scree plot was generated from the coefficient column of the agglomeration schedule and the distinct break (elbow) was sought (Sarstedt & Mooi, 2019). Third, the variance ratio criterion by Calinski and Harabasz (1974) was employed, using the following formula: $\omega_k = (VRC_{k+1} - VRC_k) - (VRC_k - VRC_{k-1})$. The number of clusters k that minimizes the value in ω_k indicates the best cluster solution (Sarstedt & Mooi, 2019). Fourth, the stability of the resulted clusters was evaluated by using a different clustering procedure (k-means). Fifth, the outcomes were evaluated against the criteria of *substantiality* (whether the resulting clusters are sufficiently large for the purpose), *parsimoniousness* (whether a small set of substantial clusters is identified), *interpretability* (whether the cluster solution can be logically explained), and *predictive validity* (the extent to which the resulted cluster solution affords prediction of the related variables).

5.5. Synopsis

In this chapter, topics and issues related to the research methodology of the thesis are discussed and explained.

The study is situated within the critical realism paradigm and adheres to deductive reasoning for testing and validating the theoretical model of the teacher-inquirer identity.

The study adopts an online quantitative survey research methodology and the underlying rationale for its selection is explained. In addition, topics and issues considered during the design of the questionnaires are briefly discussed. As regards sampling methods, judgmental sampling was chiefly utilised for selecting the participants in the questionnaires. Finally, the principles and measures with reference to ethical issues are reported (i.e. ethical clearance, voluntary participation, informed consent document, data anonymity, etc.) and the research design limitations are discussed.

In the penultimate section, the PCA procedure for extracting the main components and the guiding criteria are outlined.

Lastly, the main data analysis methods and processes (group comparison, correlation, clustering) employed in the thesis are briefly explained.

6. First Study: Teachers' Perspectives Regarding Inquiry

6.1. Introduction

This chapter has a twofold aim. First, to present the research settings, methods, and instruments utilized in the first study of the thesis, and, second, to report the corresponding findings and briefly discuss them.

The chapter begins with a description of the data collection and presentation of participants' demographics. Next, the structure of the questionnaires, the design of the instruments, the construction process, and the response scales are reported. What follows is the PCA. After that, the findings of the first study are reported. The chapter concludes with a synopsis of the research settings and the major findings. Lastly, the survey on teachers' perspectives regarding inquiry can be found at Appendix B.

6.2. Data Collection

Data from teachers were collected during May-June 2019. A link to the questionnaire on teachers' perspectives regarding inquiry accompanied with an invitation message was shared on social media (Facebook, Twitter) through the researcher's personal account as well as on two special interest teachers' groups (Teachers4Europe, eTwinning) on Facebook. Group members do not always view posts on group wall, so the researcher invited members to participate in the study through personal messages as well.

6.3. Teachers' Sample

In total, 111 Greek in-service teachers, 91 females (82.0%) and 20 males (18.0%), completed the questionnaire.

Nearly half of the respondents (n=46.8%) were aged between 41 and 50 years old, one fourth had less than 41 years (n=31; 27.9%) and one fourth were over 50 years old (n=28; 25.2%).

The gender and age characteristics of the respondents are presented in Table 1.

Table 1: Teachers' gender and age (n=111)

Demographics	n	%
Gender		
Female	91	82.0%
Male	20	18.0%
Age		
21-30	1	0.9%
31-40	30	27.0%
41-50	52	46.9%
51-60	27	24.3%
Over 60	1	0.9%

All respondents reported that they had participated in a professional development opportunity during the last three years, mostly in pedagogical projects, courses and workshops, individual and collaborative research, and educational conferences. The OECD average of teacher participation in professional development opportunities is a bit lower, at 95% (OECD, 2019), therefore it can be argued that teachers who are involved in an educational innovation are a little more inclined to engage in professional development compared to the typical teacher.

Practically all respondents reported that they had a high level in English. Half of the respondents had proficient level, one fifth advanced, one fourth intermediate, while only few elementary. The OECD average of teacher participation in professional development opportunities is a bit lower, at 95% (OECD, 2019), therefore it can be argued that teachers who are involved in an educational innovation are a little more inclined to engage in professional development compared to the typical teacher.

More details about respondents' level in English are presented in Table 2.

Table 2: Teachers' English language level

English language level	n	%
Elementary	3	2.7%
Intermediate	27	24.3%
Advanced	25	22.5%
Proficient	56	50.5%

Over half of the respondents were instructor specialists (i.e. math teacher, language teacher, etc.), precisely one-third were primary school teachers, and one-sixth kindergarten teachers.

Over half of the respondents were working in primary education, more than one-third in secondary education, while there was also a small part working in other educational institution types.

Overall, respondents had adequate teaching experience. The minimum teaching experience in the sample was 3 years while the maximum 34 years. The majority of the respondents, nearly six out of ten had between 10 and 19 years of teaching experience and the average respondent had 18 years of teaching experience.

More details about respondents' profession and working experience are presented in Table 3.

Table 3: Teachers' profession and working experience

Profession demographics	N	%
Profession		
Kindergarten teacher	13	11.7%

Primary school teacher	37	33.3%
Instructor specialist	58	52.3%
Other	3	2.7%
Type of school		
Kindergarten (3-5 years old)	13	11.7%
Primary school (6-12 years old)	50	45.0%
Secondary/High/Vocational school (13-18 years old)	40	36.0%
Other	8	7.2%
Working experience		
Less than 10 years	4	3.6%
10-19 years	65	58.6%
20 years or more	42	37.8%

Overall, according to information from statistical services (ELSTAT, 2019; OECD, 2019), the sample is quite representative of the population of Greek in-service teachers in terms of gender (e.g. 71% of all Greek primary school teachers are female), age (e.g. only 4% of all Greek teachers are below 30 years old, whereas 48% are over 50 years old), and specialization (e.g. kindergarten: 10%; primary school teachers: 47%).

While there are no available data as regards Greek or European teachers' English language skills to compare, there are statistics regarding the adult working-age population in Greece and EU. Hence, according to Eurostat, a bit over half of Greek workers aged 25-64 with a tertiary education level reported that they were proficient in their best-known foreign language, while the EU average is quite lower than that (Eurostat, 2019). Therefore, it appears that teachers involved in an educational innovation have at least a bit higher level in English compared to the national or EU average.

Characteristics of the Educational Innovation.

The respondents reported that the topic of the educational innovation was related to humanities (40%), socio-political sciences (23%), natural sciences (20%), new technologies and STEM (9%), and culture (8%). There was vast range in the duration of the educational innovation; from innovations that were implemented within a school-day to innovations that lasted 10 years, yet the typical educational innovation in the sample was implemented in approximately 7-12 months (Median: 7; Mean: 12.1; SD: 15.6). Based on duration educational innovations were categorized to short- (less than 7 months; 29%), medium- (between 7 and 12 months; 53%), and long-term (over 12 months; 18%).

6.4. Questionnaire on Teachers' Perspectives Regarding Inquiry

The questionnaire on teachers' perspectives regarding inquiry is comprised of 6 sections and a total of 113 questions (see Appendix B).

The first section collects participants' demographics. The second section collects data about the educational innovation they were involved with. In the third section data about participants' information literacy skills are collected. The fourth section gathers data about participants' sense of ownership, sense-making, and agency with reference to the educational innovation. The fifth section collects data about participants' perceptions of the three modes of existence with regards to the pedagogical innovation. The sixth section gathers data about participants' inquiry skills during the educational innovation.

6.4.1. Design of the Instruments

The instrument on information literacy skills was created based on the computer and information literacy framework by Fraillon et al. (2013). The instruments on ownership, sense-making, and agency were created based on two empirical studies by Ketelaar and her colleagues on teachers' perceptions of ownership, sense-making, and agency when a new

pedagogy or innovation is implemented (Ketelaar et al., 2012, 2014). The instruments on being, doing, and having modes of existence were created based on a qualitative study by Avidov-Ungar and Forkosh-Baruch (2018) on the MoE composing teachers' professional identity with regards to pedagogical innovation. The instrument regarding the inquiry skills when an educational innovation is implemented was created based on the teacher-inquirer model.

6.4.2. Construction of the Questionnaire

The questionnaire was constructed and refined through five stages. Initially, the researcher crafted a number of question items for each one of the instruments. Next, the supervisor reviewed the question items and added a few question items as well. In the third stage, the questionnaire was developed in an online survey tool and was shared with a group of doctoral students in the field of e-learning who offered feedback on its overall design. In the fourth stage, the questionnaire was translated into Greek by the first author and developed on the online survey tool. In the last stage, the questionnaire in Greek was sent to four Greek teachers with ample experience in conducting educational innovation in their own contexts. Based on their feedback ambiguous items were either rewritten or removed from the questionnaire.

6.4.3. Response Scales

The response scale in the instruments regarding information literacy skills, ownership, sense-making, agency, and MoE is a 5-point scale ranging from 'very low' (1) to 'very high' (5). In the instrument related to inquiry skills, the response scale ranges from 'not at all' (1) to 'to a great extent' (5), except for writing and presenting where the response scale ranges from 'never' (1) to 'many times' (5).

6.5. PCA

6.5.1. Information Literacy Skills

Teachers were asked to report on the conceptions of their information literacy skills based on an instrument of 7 items. One of the items ('Using information safely and securely (e.g. using strong passwords, knowing ways to protect private information)'), though it had an adequate value in communality (0.535), it was considered quite low and it was examined whether its removal might strengthen the instrument. Hence, on removing the item, it was observed that the instrument's reliability remained unaffected, whereas the total variance explained by the one-factor structure increased by more than 3%. PCA showed an adequate one-component structure (KMO=0.874 and a significant Bartlett test, $p<0.000$), explaining 71.13% of the total variance with factor loadings ranging from 0.787 to 0.895. The instrument showed excellent reliability, with a Cronbach's α of 0.911.

6.5.2. Ownership

Teachers were asked to report on their conceptions of ownership related to the educational innovation based on an instrument of 4 items. PCA showed an adequate one-component structure (KMO=0.682 and a significant Bartlett test, $p<0.000$), explaining 65.57% of the total variance with factor loadings ranging from 0.772 to 0.869. The instrument showed good reliability, with a Cronbach's α of 0.821.

6.5.3. Sense-making

Teachers were asked to report on their conceptions of sense-making related to the educational innovation based on an instrument of 5 items. One of the items ('I have developed similar pedagogical projects in the past') showed low communality (0.417) and was removed from the instrument. PCA showed an adequate one-component structure (KMO=0.829 and a significant Bartlett test, $p<0.000$), explaining 76.83% of the total

variance with factor loadings ranging from 0.799 to 0.924. The instrument showed good reliability, with a Cronbach's α of 0.878.

6.5.4. Agency

Teachers were asked to report on their conceptions of agency related to the educational innovation based on an instrument of 5 items. One of the items ('The failures of the project are more due to my choices rather to external factors') showed low communality (0.296) and was removed from the instrument. PCA showed an adequate one-component structure (KMO=0.704 and a significant Bartlett test, $p<0.000$), explaining 61.83% of the total variance with factor loadings ranging from 0.725 to 0.891. The instrument showed acceptable reliability, with a Cronbach's α of 0.788.

6.5.5. Conceptions of Modes of Existence

Teachers were asked to report on their conceptions of MoE based on an instrument of 34 items. The initial PCA showed a complex solution. Seven components emerged, yet two components had only 2 items with loadings over 0.550 and many items loaded in several components. Therefore, it was decided to try to reduce the number of factors to six.

The PCA with forced six components provided a clearer structure (KMO=0.805 and a significant Bartlett test, $p<0.000$), explaining 68.66% of the total variance. However, there were still many items that loaded in more than one factors and or did not have adequate loadings. Therefore, gradually seven items were removed: 'I tried to integrate the project activities in the daily class', 'Students encouraged me for doing the project', 'The project helped me to understand that I should enrich my teaching practice with new technological tools', 'The project helped me to understand that I should utilize traditional teaching practices less', 'I encouraged my students to focus on the process rather than on the product', 'Due to

the project I tried to utilize more activities where students self-manage their learning', 'I shared my thoughts and feelings with my students as regards the development of the project'.

After the removal of the aforementioned items, PCA showed an adequate six-component structure (KMO=0.862 and a significant Bartlett test, $p < 0.000$), explaining 73.15% of the total variance. The rotated factor solution (Oblimin with Kaiser normalization) provided factor loadings ranging from 0.673 to 0.873, from 0.577 to 0.818, from 0.653 to 0.862, from 0.670 to 0.932, from 0.844 to 0.901, and from 0.528 to 0.902 correspondingly. All instruments showed at least acceptable reliability with a Cronbach's α of 0.878, 0.739, 0.902, 0.916, 0.929, and 0.834 correspondingly.

The first component contained five items: 'The project helped me to understand that teaching should aim towards the acquisition of higher-order thinking skills', 'The project helped me to understand that I should improve my teaching methods', 'The project helped me to understand that I should utilize more student-centered teaching practices', 'The project helped me to understand that I should adapt my teaching practices to societal needs', 'The project helped me to understand that I should overcome challenges in order to improve my students' learning'. This component can be called '*Being – Pedagogical domain*'.

The second component contained three items: 'The project helped me to understand that I have to manage the increased workload', 'The project helped me to understand that I have to find a balance between the increased workload and personal life', 'I tried to reconcile the needs of the project with the Needs related to the school syllabus'. This component can be called '*Being – Management of change domain*'.

The third component contained four items: 'The project helped me to understand that I have to increase my knowledge in the disciplinary domain', 'The project helped me to understand that I have to increase my knowledge in new teaching methods that are relevant to

the disciplinary domain', 'The project helped me to understand that I have to acquire more teaching experience in the disciplinary domain', 'The project helped me to understand that I have to prepare more in order to teach the subject matter'. This component can be called '*Being – Disciplinary domain*'.

The fourth component contained six items: 'Due to the project I tried to utilize more activities where students learn from experience', 'Due to the project I tried to utilize more activities where students' collaboration is needed', 'Due to the project I tried to utilize more activities where students are active in the class', 'The project helped me to interact more meaningfully with my students', 'The project helped me to motivate my students', 'The project helped me to become more responsive to students' needs'. This component can be called '*Doing and Having – Pedagogical activities and teachers' needs domain*'.

The fifth component contained four items: 'Due to the project I tried to utilize technological tools in my teaching more often', 'Due to the project I tried to utilize more technological tools in my teaching', 'Due to the project technological tools have become more integrated in the learning process', 'Due to the project I encouraged students to use technological tools in their assignments'. This component can be called '*Doing – Technological activities in classroom teaching domain*'.

The sixth component contained five items: 'The project helped me to collaborate with other teachers', 'Colleagues supported me', 'The school director supported me', 'The school staff supported me in the technical aspects of the project', 'Parents encouraged me for doing the project'. This component can be called '*Having – Needs related to the institution domain*'.

6.5.6. Inquiry Skills

Teachers were asked to report on their conceptions of inquiry skills related to the TFM based on an instrument with 43 items. The initial PCA showed a complex eight-component solution with many items loading in more than one component. Therefore, gradually ten items were removed: 'Checking whether students could see and understand the connections across content areas', 'Attending educational events related to a particular problem in students' learning', 'Collecting further information to ensure accurate understanding of a particular problem in students' learning', 'Reviewing information regarding problems in students' learning to identify an area for concentrated action', 'Recognizing strengths and opportunities to build upon for addressing a particular problem in students' learning', 'Identifying challenges in addressing a particular problem in students' learning', 'Generating ideas on how to address a particular problem in students' learning and considering the feasibility of each one', 'Checking whether students are able to reflect on their learning', 'Designing assessment methods and checking their quality and relevance to a particular problem in students' learning', 'Designing the data collection methods for evaluation of the lesson plans'.

After the removal of these items, PCA showed an adequate six-component structure, yet one component had more than ten items, therefore it was tried to reduce the items of this component, without hurting its essence. Gradually, three items were removed from that component: 'Reflecting on the design of the assessment methods to learn from the experience', 'Reflecting on the outcomes of the intervention to learn from the experience', 'Evaluating the implementation of the lesson plans'.

After the removal of these items, PCA showed an adequate six-component structure (KMO=0.867 and a significant Bartlett test, $p < 0.000$), explaining 72.94% of the total variance. The rotated factor solution (Oblimin with Kaiser normalization) provided factor

loadings ranging from 0.700 to 0.849, from 0.757 to 0.945, from 0.575 to 0.801, from 0.661 to 0.903, from 0.655 to 0.777, and from 0.651 to 0.731. All instruments showed at least acceptable reliability with a Cronbach's α of 0.841, 0.950, 0.782, 0.950, 0.829, and 0.704 respectively.

The first component contained three items: 'Checking whether students demonstrate the kinds of social and collaborative skills needed for teamwork and citizenship', 'Checking whether students are able to monitor and manage their own emotions', 'Checking whether prior knowledge and cultural backgrounds that students bring to the setting are valued and utilized'. This component can be called '*Searching*'.

The second component contained four items: 'Searching for literature related to a particular problem in students' learning', 'Evaluating literature found for quality and relevance with a particular problem in students' learning', 'Reading literature to increase knowledge about a particular problem in students' learning', 'Recording and organizing the information related to a particular problem in students' learning'. This component can be called '*Understanding*'.

The third component contained four items: 'Discussing with other teachers at school about a particular problem in students' learning', 'Asking about ways to address a particular problem in students' learning on internet', 'Asking more knowledgeable others about ways to address a particular problem in students' learning', 'Asking about ways to address a particular problem in students' learning in professional meetings with other teachers'. This component can be called '*Exploring*'.

The fourth component contained nine items: 'Designing assessment methods and checking their quality and relevance to a particular problem in students' learning', 'Designing the data collection methods for evaluation of the lesson plans', 'Implementing lesson plans

that address a particular problem in students' learning', 'Collecting data during and/or after the implementation of the lesson plans', 'Evaluating the design of lesson plans', 'Evaluating the design of the assessment methods of the lesson plans', 'Analysing collected data and evaluating the extent to which the particular problem in students' learning has been addressed', 'Reflecting on the design of the lesson plans to learn from the experience', 'Reflecting on the implementation of the lesson plans to learn from the experience'. This component can be called '*Designing, implementing, evaluating, and reflecting*'.

The fifth component contained five items: 'I wrote a text about the process of addressing the particular problem in students' learning and I published it on the internet', 'I wrote an article about the process of addressing the particular problem in students' learning for publishing in an academic journal', 'I wrote a text about the process of addressing the particular problem in students' learning for publishing on local media', 'I wrote a text about the process of addressing the particular problem in students' learning for publishing on educational websites', 'I presented the process of addressing the particular problem in students' learning in an academic conference'. This component can be called '*Writing*'.

The sixth component contained three items: 'I presented the process of addressing the particular problem in students' learning in an interactive workshop', 'I presented the process of addressing the particular problem in students' learning in a meeting within the school', 'I presented the process of addressing the particular problem in students' learning in a professional meeting with other teachers'. This component can be called '*Presenting*'.

6.6. Findings

6.6.1. What Are Teachers' Perceptions Regarding Their Skills, Their Participation in Professional Development Opportunities, and the Extent to Which They Have Practiced Inquiry Skills in Light of the Educational Innovation?

The first research question is broken down to three sub-questions. The first sub-question is related to teachers' perceptions regarding the information literacy skills they have. The second sub-question is related to teachers' perceptions regarding their participation in professional development opportunities. Lastly, the third sub-question is related to teachers' perceptions regarding the inquiry skills that they practiced in light of the innovation.

What Are the Information Literacy Skills That Teachers Perceive They Have?

Overall, teachers reported that they have high or better information literacy skills, yet there was a quite high variation in their responses (see Table 4).

The highest average value was observed in the skill of sharing information in which the typical teacher reported to have close to very high skills (mean: 4.68), while the lowest value in the skill of transforming information in which the typical teacher reported to have high skills (mean: 4.15). However, there was quite high dispersion in the responses with Standard Deviation (SD) average values at nearly 0.80.

Table 4: Means and standard deviations of teachers' information literacy skills (1: very low; 2: low, 3: moderate, 4: high, 5: very high).

Information literacy skills	Mean	SD
Knowing about and understanding computer use	4.54	0.55
Accessing and evaluating the information on the web	4.51	0.54
Managing information	4.54	0.60
Transforming information	4.15	0.81

Presenting information	4.52	0.64
Sharing information	4.68	0.50
Using information safely and securely	4.28	0.78
	4.46	0.78

It is difficult to determine whether the level of information literacy skills of the respondents is above or below the average since not only there are no available statistics, but also a straight comparison would have been difficult to make as information literacy skills are often regarded synonymous to 'computer literacy', 'digital literacy', 'internet literacy' and so on and are operationalized in quite diverse ways in the literature. However, in a recent Teaching and Learning International Survey conducted by the OECD it was revealed that approximately 18% of teachers across the OECD country members express a high need for training in ICT skills (OECD, 2019). Therefore, in terms of information literacy skills it seems that teachers involved in an educational innovation have much higher level compared to the typical teacher.

To What Extent Teachers Participated in Professional Development?

Overall, teachers reported that they had participated at least to some extent to professional development opportunities during the last three years and it appears that they participate in some professional development opportunities more than others (see Table 5).

More specifically, on average teachers participated to a moderate extent to pedagogical projects, courses and workshops as well as individual and collaborative research, to some extent to educational conferences, mentoring and peer observation, and professional development networks, and to a small extent to observation visits to other schools. However, there was quite high dispersion in the responses with SD average values over 1.00 in a 5-point scale.

Table 5: Means and standard deviations of teachers' participation in professional development opportunities (1: not at all; 2: to a small extent; 3: to some extent; 4: to a moderate extent; 5: to a great extent).

Professional development opportunities	Mean	SD
Courses and workshops	3.83	1.01
Educational conferences	3.21	1.29
Observation visits to other schools	2.15	1.22
Professional development networks	2.68	1.41
Individual and collaborative research	3.51	1.27
Mentoring and peer observation	2.70	1.34
Pedagogical/School projects (e.g. eTwinning, T4E)	4.05	1.16
	3.16	1.24

To What Extent Teachers Perceive That They Have Practiced Their Inquiry Skills?

Overall, teachers reported that they practiced their inquiry skills at least to some extent in light of an educational innovation (see Table 6). Thus, these findings confirmed that the theoretical model is sound and logical, yet not entirely, since the empirical analysis (see section 8.2.), revealed a differed way of how inquiry skills are perceived and exercised in practice by teachers. The results are presented in more detail regarding each inquiry skill in the paragraphs that follow.

Teachers reported that they practice searching and focusing skills to a moderate extent (means 3.62 and 3.71 respectively). Overall, not much variation was observed in the means of the different searching skills, though it appears that some inquiry skills were practiced more than others. Hence, checking whether students are able to set specific personal learning goals

had the lowest value (3.34), whereas checking whether students demonstrate the kinds of social and collaborative skills needed for teamwork and citizenship the highest (3.92). As regards focusing skills, there were practically no variations in the means among the different skills (lowest: 3.68; highest: 3.77). It should be noted, however, that the average SDs values were quite high in both searching and focusing skills (0.88 and 0.93 respectively).

Teachers reported that they practice understanding and exploring skills to a moderate extent (means 3.27 and 2.97 respectively). Whereas there was practically no variation in the means of the different understanding skills (lowest: 3.21; highest: 3.32), important variation was observed in the average values of the different exploring skills, which means that the typical teacher practiced some skills more than others. Hence, teachers seem to prefer discussing with their colleagues at school about the problem in students' learning (3.32) and/or attend educational events (3.14), whereas their least preferred way is to ask others through social media or educational websites (2.58). The SD value is very high in both understanding and exploring skills (over 1.20), which shows that there was high variation in teachers' responses.

Teachers reported that they practice designing and implementing skills to a moderate extent (means 3.29 and 3.65 respectively). As regards designing skills, the variation in the means of the different skills was minimal (lowest: 3.11; highest: 3.47). On the other hand, teachers reported that they practice monitoring and observing students' learning to a high extent, whereas they engage in lesson plan implementation and data collection to a moderate extent. Lastly, both average SDs values were high (close to 1.00).

Teachers reported that they practice evaluating and reflecting skills to a moderate extent (means 3.33 and 3.63 respectively). In general, little variation was observed in the means of the different evaluating (lowest: 3.17; highest: 3.49) and reflecting (lowest: 3.50;

highest: 3.76) skills, yet the average SDs were high (over 1.00) indicating that there was high variation in teachers' responses.

By far the lowest average values were observed in the skills of writing and presenting (1.44 and 1.77 respectively). This outcome should be interpreted with caution, however, since a different response scale was used in these two skills.

A closer look at the data shows that more than half of the teachers (53%) reported that at the end of the educational innovation, they write a text to disseminate their experience. In addition, more than four out of ten teachers reported that they write a text to publish it on social media or their personal blog/website, three out of ten to publish it on academic journals, and more than two out of ten to publish it on educational websites and local media.

Compared to writing, teachers are keener in presenting their experience at the end of the educational innovation as more than three out of four teachers (77%) reported that they presented their experience. Two-thirds of the teachers did so within their own school environment, more than half made a presentation in a professional meeting with other teachers outside of the school, more than four out of ten presented their work in an interactive workshop, and more than three out of ten made a presentation in an academic conference.

Thus, a bit over half of the teachers wrote a text to share their experience and three out of four delivered a presentation to an audience. This is an intriguing outcome regarding the practice of inquiry skills especially if it is considered that these rates are remarkably lowered for academic texts and presentations. A future research could investigate in more depth why many teachers who are engaged in an educational innovation are not inclined to share their experience with the community and even more with the academic community. On the other hand, taking into account that many action research models do not consider writing and/or presenting as important parts of the classroom inquiry process, it might be open to

debate whether writing and presenting skills are vital elements of the teacher-inquirer identity.

Table 6: Means and standard deviations of the extent to which teachers practiced their inquiry skills in light of the educational innovation (searching – reflecting: 1: not at all; 2: to a small extent; 3: to some extent; 4: to a moderate extent; 5: to a great extent / writing – presenting: 1: never; 2: 1-2 times; 3: 3-4 times; 4: 5-6 times; 5: many times).

Inquiry Skills	Mean	SD	
Searching	Checking whether students are able to reflect on their learning	3.52	0.82
	Checking whether students are able to set specific personal learning goals	3.34	0.92
	Checking whether students demonstrate the kinds of social and collaborative skills needed for teamwork and citizenship	3.95	0.83
	Checking whether students are able to monitor and manage their own emotions	3.79	0.94
	Checking whether prior knowledge and cultural backgrounds that students bring to the setting are valued and utilized	3.68	0.83
	Checking whether students could see and understand the connections across content areas	3.42	0.92
	3.62	0.88	
Focusing	Reviewing the information regarding problems in students' learning to identify an area for concentrated action	3.68	0.91
	Collecting further information to ensure an accurate understanding of a particular problem in students' learning	3.68	1.02
	Identifying challenges in addressing a particular problem in students' learning	3.77	0.88
	Recognizing strengths and opportunities to build upon for addressing a particular problem in students' learning	3.69	0.90
	3.71	0.93	
Understanding	Searching for literature related to a particular problem in students' learning	3.28	1.28
	Evaluating literature found for quality and relevance with a particular problem in students' learning	3.21	1.24
	Reading literature to increase knowledge about a particular problem in students' learning	3.28	1.23

	Recording and organizing the information related to a particular problem in students' learning	3.32	1.18
		3.27	1.23
	Discussing with other teachers at school about a particular problem in students' learning	3.32	1.21
	Asking about ways to address a particular problem in students' learning on educational websites/social media	2.58	1.23
Exploring	Asking more knowledgeable others about ways to address a particular problem in students' learning	2.93	1.23
	Attending educational conferences/meetings/courses related to a particular problem in students' learning	3.14	1.29
	Asking about ways to address a particular problem in students' learning in professional meetings with other teachers	2.86	1.33
		2.97	1.26
	Generating ideas on how to address a particular problem in students' learning and considering the feasibility of each one	3.47	1.92
Designing	Creating lesson plans that focus on addressing a particular problem in students' learning and checking their quality and relevance to the particular problem	3.34	1.14
	Designing assessment methods and checking their quality and relevance to a particular problem in students' learning	3.23	1.14
	Designing the data collection methods for evaluation of the lesson plans	3.11	1.13
		3.29	1.08
Implementing	Implementing lesson plans that address a particular problem in students' learning	3.29	1.12
	Collecting data during and/or after the implementation of the lesson plans	3.24	1.15
	Monitoring students' understanding and learning	3.97	0.80
	Observing students' learning behaviours	4.11	0.84
		3.65	0.98
	Evaluating the design of lesson plans	3.49	.98
	Evaluating the design of the assessment methods of the lesson plans	3.25	1.07

Evaluating	Evaluating the implementation of the lesson plans	3.42	1.03
	Analysing collected data and evaluating the extent to which the particular problem in students' learning has been addressed	3.17	1.17
		3.33	1.06
Reflecting	Reflecting on the design of the lesson plans to learn from the experience	3.61	1.06
	Reflecting on the design of the assessment methods to learn from the experience	3.50	1.11
	Reflecting on the implementation of the lesson plans to learn from the experience	3.66	1.11
	Reflecting on the outcomes of the intervention to learn from the experience	3.76	1.01
		3.63	1.07
Writing	I wrote a text about the process of addressing the particular problem in students' learning, and I published it on social media/personal blog/website	1.66	1.00
	I wrote an article about the process of addressing the particular problem in students' learning for publishing in an academic journal	1.37	0.66
	I wrote a text about the process of addressing the particular problem in students' learning for publishing on local media	1.32	0.71
	I wrote a text about the process of addressing the particular problem in students' learning for publishing on educational websites	1.41	0.88
		1.44	0.81
Presenting	I presented the process of addressing the particular problem in students' learning in an academic conference/symposium	1.50	0.95
	I presented the process of addressing the particular problem in students' learning in an interactive workshop	1.59	0.88
	I presented the process of addressing the particular problem in students' learning in a meeting within the school	2.12	1.09
	I presented the process of addressing the particular problem in students' learning in a professional meeting with other teachers (outside of the school)	1.87	1.09
		1.77	1.00

6.6.2. To What Extent Practicing of Inquiring Skills is Related to Other Relevant Skills, Perceptions of Ownership, Sense-Making, and Agency, and Teachers' Perceptions of Being, Doing, and Having?

The second research question is broken down to three sub-questions all related to the practice of inquiry skills in light of an innovation. The first sub-question is concerned with the relation between information literacy, English language, and inquiry skills. The second sub-question is concerned with the relation between perceptions of ownership, sense-making, agency, and inquiry skills. The third sub-question is concerned with the relation between perceptions of being, doing, having, and inquiry skills.

To What Extent Information Literacy and English Language Skills are Related to the Inquiry Skills that Teachers Practice in Light of an Educational Innovation?

Table 7 shows the descriptive results (mean and standard deviations) and the correlation between the variables of information literacy skills, English language skills, and inquiry skills. Table 8 shows the squared correlation coefficient of the relationships.

Table 7: Means, standard deviations, and correlations between the variables of information literacy skills, English language skills, and inquiry skills (n=111).

Variable		Information literacy skills	English skills
	M (SD)	4.49 (0.51)	4.23 (0.85)
Searching	3.80 (0.76)	0.21	0.06
Understanding	3.27 (1.15)	0.21	-0.06
Exploring	2.92 (0.98)	0.24	0.01

Designing, Implementing, Evaluating, Reflecting	3.36 (0.93)	0.26 ^a	0.04
Writing	1.45 (0.66)	0.24	0.09
Presenting	1.12 (0.49)	0.14	-0.07

^a $p < 0.006$. Bonferroni correction $0.05/8 = 0.006$

^b $p < 0.001$. Bonferroni correction $0.01/8 = 0.001$

Table 8: Squared correlation coefficients between the variables of information literacy skills, English language skills, and inquiry skills.

Variable	Information literacy skills	English skills
Searching	4.2	0.4
Understanding	4.4	0.4
Exploring	5.7	0.0
Designing, Implementing, Evaluating, Reflecting	6.7 ^a	0.2
Writing	5.8	0.9
Presenting	1.9	0.5

^a $p < 0.006$. Bonferroni correction $0.05/8 = 0.006$

^b $p < 0.001$. Bonferroni correction $0.01/8 = 0.001$

The results show that there is minimal correlation between information literacy and inquiry skills, while there is no correlation between English language and inquiry skills. More specifically, only the inquiry skill of designing, implementing, evaluating, and reflecting is correlated to information literacy skills, while the shared variation is only 6.7%.

While this outcome could be easily interpreted as a no connection between the two, taking into account that practically all teachers who responded to the questionnaire reported

high level of information literacy and English language skills, it is better to be cautious before arriving to such conclusions hastily.

To What Extent Perceptions of Ownership, Sense-Making, and Agency are Related to the Inquiry Skills That Teachers Practice in Light of an Educational Innovation?

Table 9 shows the descriptive results (mean and standard deviations) and the correlation between the variables of ownership, sense-making, agency, and inquiry skills. Table 10 shows the squared correlation coefficient of the relationships.

Table 9: Means, standard deviations, and correlations between the variables of ownership, sense-making, agency, and inquiry skills (n=111).

Variable		Ownership	Sense-making	Agency
	M	4.15	4.24	4.10
	(SD)	(0.72)	(0.77)	(0.79)
Searching	3.80 (0.76)	0.53 ^b	0.53 ^b	0.42 ^b
Understanding	3.27 (1.15)	0.33 ^b	0.35 ^b	0.23
Exploring	2.92 (0.98)	0.42 ^b	0.39 ^b	0.16
Designing, Implementing, Evaluating, Reflecting	3.36 (0.93)	0.42 ^b	0.47 ^b	0.24
Writing	1.45 (0.66)	0.33 ^b	0.32 ^b	0.11
Presenting	1.12 (0.49)	0.30 ^a	0.24	0.23

^a $p < 0.006$. Bonferroni correction $0.05/9 = 0.006$

^b $p < 0.001$. Bonferroni correction $0.01/9 = 0.001$

Table 10: Squared correlation coefficients between the variables of ownership, sense-making, agency, and inquiry skills.

Variable	Ownership	Sense-making	Agency
Searching	27.7 ^b	27.7 ^b	17.6 ^b
Understanding	10.6 ^b	12.4 ^b	5.4
Exploring	17.4 ^b	15.5 ^b	2.7
Designing, Implementing, Evaluating, Reflecting	17.8 ^b	22.1 ^b	5.7
Writing	11.0 ^b	10.3 ^b	1.3
Presenting	9.2 ^a	5.8	5.3

^a $p < 0.006$. Bonferroni correction $0.05/9 = 0.006$

^b $p < 0.001$. Bonferroni correction $0.01/9 = 0.001$

The results show that, in general, there is a positive correlation between ownership, sense-making, agency and inquiry skills. More specifically, ownership is correlated to all inquiry skills, sense-making with all inquiry skills except presenting, while agency is correlated only with searching skills. On average, the shared variation between inquiry skills and the variables of ownership, sense-making, and agency is 15.6%, 15.6%, and 6.3% correspondingly. The results are presented in more detail regarding each of the six inquiry skills in the paragraphs that follow.

The searching skill demonstrates by far the strongest relationships with ownership, sense-making, and agency compared to the other inquiry skills. Besides, it is the only inquiry skill that is correlated to all three. The shared variation in the relationships is over 17% and the average shared variation is at 24.3%.

Understanding and exploring skills are positively correlated to ownership and sense-making. The average shared variation in these relationships is at 11.5% and 16.5% correspondingly.

The designing, implementing, evaluating, and reflecting skill demonstrates the second stronger relationship with ownership and sense-making. The average shared variation in the relationships is at 17.8% and 22.1% correspondingly.

The writing skill is positively correlated to ownership and sense-making with an average shared variation at 10.6%.

Lastly, the presenting skill is positively correlated only with ownership, while the relationship is rather weak with an average shared variation at 9.2%.

Taking into account that perceptions of ownership are related to the extent to which teachers are willing to engage with an educational innovation (Berrill & Whalen, 2007) or inquiry-based working (Baan et al., 2020), and to communicate about it (Ketelaar et al., 2012, 2014), it could be argued that this is corroborated at least to some extent by the aforementioned outcomes, since the more the teachers engaged with the educational innovation and sensed ownership, the more they practiced their inquiry skills. Similarly, increased sense of ownership was accompanied by higher practice of communicating skills, that is writing and presenting. On the other hand, it is difficult to understand why some skills are more strongly connected with ownership than others.

As regards sense-making, it could be argued that teachers who practiced their inquiry skills to a high extent were in a state of assimilation or accommodation of the teacher identity required by the educational innovation, whereas teachers who practiced their inquiry skills to a moderate or low extent were in a state of toleration or distantiation (Luttenberg et al.,

2013). It is impossible to infer, nonetheless, at which point this change in the type of sense-making occurs, whether practice of inquiry skills is more related to assimilation or accommodation in particular, and why some inquiry skills are more strongly connected with sense-making than others. However, bearing in mind that different combinations of the four types of sense-making can be found within one teacher in light of an educational innovation (Luttenberg et al., 2013), we could assume that weak connections with sense-making indicate that an anomaly is more possible to occur, which probably denotes a different type of sense-making. To put it more simply, teachers who reported high sense-making, but they did not practice their presenting skills (no connection with sense-making) or they only limitedly practiced their understanding skills (low connection with sense-making), were in a state of toleration or distantiation as regards the practicing of these skills and the respective activities.

Lastly, as regards agency, while it sounds logical that the extent to which agency was exercised by teachers in light of the educational innovation was connected to the practice of searching skills, since high or 'progressive' agency is accompanied by active engagement with the innovation, it does not explain why agency is not connected with other inquiry skills. Perhaps teachers recognized the critical role of the students in the development of the innovation, thus they may perceived that they did not have such an active role in the realization of the innovation or so much control of the decisions because their students played a more important role in the development of the project in nearly every aspect.

To What Extent Perceptions of Being, Doing, and Having are Related to the Inquiry Skills That Teachers Practice in Light of an Educational Innovation?

Table 11 shows the descriptive results (mean and standard deviations) and the correlation between the variables of being, doing, having, and inquiry skills. Table 12 shows the squared correlation coefficient of the relationships.

Table 11: Means, standard deviations, and correlations between the variables of being, doing, having, and inquiry skills (n=111).

Variable		Being Pedagogical	Being Management of change	Being Disciplinary	Doing Technological teaching	Doing and Having Pedagogical activities and teachers' needs	Having Needs related to the school
	M (SD)	4.04 (0.80)	3.72 (0.86)	3.21 (1.10)	3.62 (1.03)	4.18 (0.73)	3.08 (1.07)
Searching	3.80 (0.76)	0.29 ^a	0.22	0.19	0.26	0.54 ^b	0.28 ^a
Understanding	3.27 (1.15)	0.40 ^b	0.14	0.30 ^a	0.31 ^a	0.39 ^b	0.25
Exploring	2.92 (0.98)	0.37 ^b	0.24	0.31 ^a	0.30 ^a	0.32 ^a	0.51 ^b
Designing, Implementing, Evaluating, Reflecting	3.36 (0.93)	0.35 ^b	0.23	0.30 ^a	0.45 ^b	0.38 ^b	0.33 ^b
Writing	1.45 (0.66)	0.31 ^a	0.14	0.10	0.28 ^a	0.23	0.19
Presenting	1.12 (0.49)	0.20	0.09	0.16	0.23	0.15	0.31 ^a

^a $p < 0.004$. Bonferroni correction $0.05/12 = 0.004$

^b $p < 0.0008$. Bonferroni correction $0.01/12 = 0.0008$

Table 12: Squared correlation coefficients between the variables of being, doing, having, and inquiry skills.

Variable	Being Pedagogical	Being Management of change	Being Disciplinary	Doing Technological teaching	Doing and Having Pedagogical activities and teachers' needs	Having Needs related to the school
Searching	8.1 ^a	5.0	3.4	6.7	29.3 ^b	8.1 ^a
Understanding	16.3 ^b	2.0	8.9 ^a	9.9 ^a	15.5 ^b	6.2
Exploring	13.7 ^b	5.8	9.5 ^a	9.0 ^a	10.1 ^a	26.1 ^b
Designing, Implementing,	12.1 ^b	5.5	8.8 ^a	20.3 ^b	14.1 ^b	11.0 ^b

Evaluating, Reflecting						
Writing	9.4 ^a	1.9	1.0	7.8 ^a	5.2	3.5
Presenting	4.0	0.7	2.7	5.2	2.2	9.7 ^a

^a $p < 0.004$. Bonferroni correction $0.05/12 = 0.004$

^b $p < 0.0008$. Bonferroni correction $0.01/12 = 0.0008$

The results show that there is a positive correlation between perceptions of being, doing, having and inquiry skills. From the 36 total relationships, 20 are marked statistically significant (56%). Most statistically significant relationships can be observed between being – pedagogical domain and inquiry skills, in total five, whereas none occurs between being - management of change domain and inquiry skills. Overall, in most of the cases the shared variance is at 10% and only in few exceptions the shared variance reached over 20%. The average shared variation in the statistically significant relationships is nearly 13%. The results are presented in more detail regarding each of the six inquiry skills in the paragraphs that follow.

The searching skill is positively correlated to being – pedagogical domain, doing and having - pedagogical activities and teachers' needs domain, and having - Needs related to the school domain. The relationship with doing and having is by far the strongest among all other relationships with a shared variance at nearly 30%. The relationships with being (pedagogical domain) and having (Needs related to the school domain) demonstrate a shared variance at 8.1%.

The understanding skill is positively correlated to being – pedagogical domain, being – disciplinary domain, doing – technological teaching, and doing and having - pedagogical activities and teachers' needs domain. The relationships with being (pedagogical domain) and doing and having (pedagogical activities and teachers' needs domain) are quite strong with a

shared variance over 15%, whereas the relationships with being (disciplinary domain) and doing (technological teaching) are weaker with a shared variance below 10%. Overall, the average shared variance is at nearly 10%.

The exploring skill is positively correlated to all variables, except the conception of being – management of change domain. The relationship with having is by far the strongest one with shared variance at 26.1%. In the other four relationships the shared variance ranges from 9% to 13.7%. Overall, the average shared variance is over 12%.

The designing, implementing, evaluating, and reflecting skill is positively correlated to all variables, except the conception of being – management of change domain. The relationship with doing (technological teaching domain) is the strongest one with shared variance at 20.3%. The relationships with doing and having, having, and being (pedagogical domain) are also quite strong with shared variance ranging from 11% to 14% approximately. Overall, the average shared variance is nearly 12%.

The writing skill is positively correlated to being – pedagogical domain and doing - technological teaching domain. Both relationships are quite weak with shared variance approximately 8-9%.

Lastly, the presenting skill is positively correlated only with having - needs related to the school domain. The shared variance of this relationship is nearly 10%.

In the next paragraphs these findings are briefly discussed from the perspective of the MoE.

Starting with teachers' perceptions of being – pedagogical domain – relationships were found with all inquiry skills except presenting. While it is not easy to explain why no relationship was found with presenting skills, for the rest of the skills it is reasonable to

assume that when teachers understand the need to change their teaching methods, they put on practice their inquiry skills.

With reference to being -disciplinary domain- relationships were found with understanding, exploring, and designing, implementing, evaluating, and reflecting skills. These results indicate that teachers' conceptions of being -disciplinary domain- are connected with the extent to which they practice specific inquiry skills. Hence, teachers who perceive that they have to increase their knowledge in the discipline they will study resources, explore what other teachers know, invest time to design lessons on the discipline, and so on. On the other hand, it could be argued that searching for problems in students' learning or communicating their experience are not connected with how teachers think of themselves as subject matter experts.

Perceptions of being -management of change domain- is the only domain that did not demonstrate any relationship with inquiry skills. There at least two interpretations of this outcome. First, taking into account that increased practicing of inquiry skills is not accompanied with an increased understanding of the need to manage with the change, it could be assumed that teachers were overworking in light of an educational innovation, while they felt that they could not do anything to reduce or balance the workload or to reconcile the needs of the project with the needs of the syllabus. Second, that teachers did not feel that their workload was increased due to the educational innovation and, subsequently, they did not perceive that there was a connection between increased practicing of inquiry skills and their workload.

Perceptions of doing – technological teaching – were strongly related to designing, implementing, evaluating, and reflecting skills and to a much lesser extent to understanding, exploring, and writing skills. Undoubtedly, these findings show that teachers' efforts to

integrate technological tools in the teaching and learning process are directly related to the way they put on practice their designing and implementing skills for creating lesson plans and implement them as well as to how they are evaluating and reflecting on students' learning and the effectiveness of the lesson. On the other hand, relationships with understanding, exploring, and writing, though weak, may indicate the use of technological tools for achieving their teaching goals. In this line of thinking, one could expect relationships with searching and presenting skills as well, it should be noted, nonetheless, that the relationships with searching and presenting skills were close to be characterized significant.

Perceptions of doing and having - pedagogical activities and teachers' needs domain – demonstrated a very strong relationship with searching skills as well as quite strong relationships with understanding, exploring, and designing, implementing, evaluating, reflecting skills. Bearing in mind that these perceptions of doing and having are concentrated on teachers' efforts and needs related to classroom teaching, it came to no surprise that no connection emerged with writing and presenting skills, which are related to sharing the outcomes of the educational innovation with others. The particularly strong connection with searching skills could be explained by the fact that students' needs and teacher-students relationships are at the center of perceptions of doing and having in the pedagogical activities and teachers' needs domain.

Lastly, perceptions of having – needs related to the school domain – demonstrated a very strong relationship with exploring skills, a quite strong relationship with designing, implementing, evaluating, reflecting and presenting skills, and a weak relationship with searching skills. The strong relationship with exploring skills is easily explained since perceptions of having are related to teachers' needs to reach out to their colleagues and mentors to get advice or to collaborate. It could be argued that a collaboration affects the whole teaching process and as such it is not surprising that designing, implementing,

evaluating, reflecting, presenting, and searching skills demonstrated a relationship with perceptions of having. We could also assume that understanding skills are not related because each partner in a collaboration might develop his/her understanding on his/her own, with limited interaction with the partner. Lastly, the fact that no relation with writing skills emerged could mean that teachers who write a text to share their experience do that mostly alone and without much support from colleagues or partners.

6.6.3. To What Extent Teachers' Perceptions of Being, Doing, and Having in Light of an Educational Innovation are Related to Relevant Skills and Perceptions of Ownership, Sense-Making, and Agency?

The third research question is broken down to two sub-questions both related to teachers' perceptions of being, doing, and having in light of an innovation. The first sub-question is concerned with the relation between information literacy skills, English language skills, and teachers' perceptions of being, doing, and having. The second sub-question is concerned with the relation between perceptions of ownership, sense-making, agency, and teachers' perceptions of being, doing, and having.

To What Extent Information Literacy and English Language Skills are Related to Teachers' Perceptions of Being, Doing, and Having in Light of an Educational Innovation?

Table 13 shows the descriptive results (mean and standard deviations) and the correlation between the variables of information literacy skills, English language skills, and teachers' perceptions of being, doing, and having.

Table 13: Means, standard deviations, and correlations between the variables of information literacy skills, English language skills, and teachers' perceptions of being, doing, and having (n=111).

Variable		Information literacy skills	English skills
	M	4.49	4.23
	(SD)	(0.51)	(0.85)
Being (Pedagogical)	4.04 (0.80)	0.24	-0.02
Being (Management of change)	3.72 (0.86)	0.20	0.06
Being (Disciplinary)	3.21 (1.10)	0.08	-0.01
Doing (Technological teaching)	3.62 (1.03)	0.12	0.06
Doing and Having (Pedagogical activities and teachers' needs)	4.18 (0.73)	0.24	0.07
Having (Needs related to the school)	3.08 (1.07)	0.21	0.06

^a $p < 0.006$. Bonferroni correction $0.05/8 = 0.006$

^b $p < 0.001$. Bonferroni correction $0.01/8 = 0.001$

No statistically significant relationship emerged between information literacy skills, English language skills, and teachers' perceptions of being, doing, and having. It should be noted, however, that some relationships between information literacy skills and teachers' perceptions of being, doing, and having were close to the statistical significance threshold.

Although no relationship emerged, the high level of participants' information literacy and English language skills should be considered before arriving to conclusions. Thus, though on first look it seems that information literacy and English language skills did not have a direct impact on teachers' perceptions of being, having, and doing in light of an

educational innovation, yet, perhaps, these are skills that teachers need it in order to start, or engage with, the educational innovation.

To What Extent Teachers' Perceptions of Being, Doing, and Having in Light of an Educational Innovation are Related to Their Perceptions of Ownership, Sense-Making, and Agency?

Table 14 shows the descriptive results (mean and standard deviations) and the correlation between the variables of being, doing, having, ownership, sense-making, and agency. Table 15 shows the squared correlation coefficient of the relationships.

Table 14: Means, standard deviations, and correlations between the variables of being, doing, having, ownership, sense-making, and agency (n=111).

Variable		Ownership	Sense-making	Agency
	M (SD)	4.15 (0.72)	4.24 (0.77)	4.10 (0.79)
Being (Pedagogical)	4.04 (0.80)	0.47 ^b	0.58 ^b	0.47 ^b
Being (Management of change)	3.72 (0.86)	0.38 ^b	0.48 ^b	0.38 ^b
Being (Disciplinary)	3.21 (1.10)	0.32 ^a	0.46 ^b	0.24
Doing (Technological teaching)	3.62 (1.03)	0.39 ^b	0.43 ^b	0.30 ^a
Doing and Having (Pedagogical activities and teachers' needs)	4.18 (0.73)	0.55 ^b	0.58 ^b	0.49 ^b
Having (Needs related to the school)	3.08 (1.07)	0.47 ^b	0.34 ^b	0.17

^a $p < 0.006$. Bonferroni correction $0.05/9 = 0.006$

^b $p < 0.001$. Bonferroni correction $0.01/9 = 0.001$

Table 15: Squared correlation coefficients between the variables of being, doing, having, ownership, sense-making, and agency (N=111).

Variable	Ownership	Sense-making	Agency
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Being (Pedagogical)	21.9 ^b	34.1 ^b	22.2 ^b
Being (Management of change)	14.2 ^b	22.6 ^b	14.2 ^b
Being (Disciplinary)	10.2 ^a	21.5 ^b	5.8
Doing (Technological teaching)	15.3 ^b	18.2 ^b	9.2 ^a
Doing and Having (Pedagogical activities and teachers' needs)	30.7 ^b	33.2 ^b	23.8 ^b
Having (Needs related to the school)	21.8 ^b	11.4 ^b	2.9

^a $p < 0.006$. Bonferroni correction $0.05/9 = 0.006$

^b $p < 0.001$. Bonferroni correction $0.01/9 = 0.001$

The results show that there is a positive correlation between conceptions of ownership, sense-making, and agency and conceptions of being, doing, and having. From the total 18 relationships, 16 are marked statistically significant (89%) and the average shared variance between the variables in these relationships is approximately 20%. All relationships which include ownership and sense-making are statistically significant, whereas four out of six of the relationships with agency are statistically significant and, on average, relationships with agency demonstrate the lower shared variance. The results are presented in more detail regarding each of the conceptions of being, having, and doing in the paragraphs that follow.

Conceptions of being – pedagogical domain – demonstrate high shared variance with ownership, sense-making, and agency. The relationship with sense-making is by far the strongest one as the shared variance is at 34.1%. Relationships with ownership and agency are very strong as well with shared variance at nearly 22%. The average shared variance is approximately 26%.

Thus, the findings indicate that teachers' sense-making of the educational innovation went hand-in-hand with their understanding of the need to change their teaching methods and the way they address their students. Under the prism of the model by Luttenberg et al. (2013)

this outcome denotes that teachers who made little sense of the educational innovation most probably were in a state of assimilation (trying to adapt the new identities required by the innovation into their existing teacher identities) or distantiation (rejection of the new ideas regarding teacher identity proposed by the educational innovation). Accordingly, teachers who reported high sense-making of the educational innovation most probably were in a state of accommodation (trying to adapt the existing teacher identities so as to fit into the new identities required by the innovation) or toleration (acceptance of the new ideas regarding teacher identity proposed by the innovation in addition to, or at the cost of, existing identities).

Furthermore, it seems that the more teachers perceived ownership towards the educational innovation and achieved agency, the more they understood the need for change in their teaching methods and in how they address their students and vice versa. This result is in accordance with the study by Ketelaar and her colleagues who concluded that teachers who feel that the educational innovation is important for them and their students have a higher sense of ownership towards the innovation (Ketelaar et al., 2014).

Conceptions of being – management of change domain – demonstrate high shared variance with ownership, sense-making, and agency as well. The relationship with sense-making is the strongest one with shared variance at 22.6%. Relationships with ownership and agency demonstrate exactly the same shared variance at 14.2%. The average shared variance is 17%.

Thus, the more a teacher made sense of the educational innovation, the more he/she understood that he/she has to manage the increased workload, find a balance, and reconcile the needs of the innovation with the needs of the school syllabus. Conversely, teachers who did not make much sense of the educational innovation did not understand or experience that

need. In this case, it seems that there are two possible explanations: either these teachers did not experience an increase of their workload due to the educational innovation or they did experience an increase of their workload, yet they could not see a way to find a balance and reconcile the needs of the educational innovation with the needs of the school syllabus.

Undoubtedly, the implementation of an educational innovation is not necessarily accompanied by increased workload, so, perhaps, teachers were true in not experiencing an more workload than usual. However, another possible explanation is that although there was an increase in the workload due to the educational innovation, teachers who made little sense of the innovation did not want to deal with this additional workload. Therefore, they were rejecting the new teacher identities proposed by the educational innovation, or to name it according to the model by Luttenberg et al. (2013), they were in a state of distantiation. Contrarily, teachers who did experience the increased workload due to the introduction of the new teacher identities, but could not see a way to manage it or find a balance were clearly in a state of toleration (Luttenberg et al., 2013), since they were accepting the new ideas regarding teacher identity in addition to their pre-existing teacher identities.

Furthermore, it appears that teachers' inclination to devote time and energy in the innovation and exercise agency was accompanied by their efforts to reconcile the needs of the innovation with the needs of the school syllabus and, in general, manage the increased workload. In the study by Ketelaar et al. it was found that when teachers sensed ownership towards the innovation, then the innovation was neatly integrated into their practices (Ketelaar et al., 2014). This is corroborated by the outcomes of this thesis, since it could be argued that an increased sense of ownership was accompanied by increased efforts to integrate the innovation into classroom practice and manage the workload.

Conceptions of being – disciplinary domain – are positively correlated only with ownership and sense-making. The relationship with sense-making is the strongest one with shared variance at 21.5%, while the relationship with ownership is over 10%. The average shared variance (including agency) is 12.5%.

The connection with sense-making highlights that the more teachers made sense of the educational innovation the more they understood that they have to expand their knowledge and teaching methods in the disciplinary domain. In other words, through the engagement with the educational innovation teachers acquired a finer understanding of their knowledge and teaching skills, that is of their teacher identity as subject matter and didactical expert. On the contrary, teachers who made little sense of the educational innovation did not see the need to expand their knowledge and skills in order to address the new challenges that came along with the introduction of the innovation.

This outcome could be interpreted in two different ways. First, it could be hypothesized that the educational innovation was quite trivial and subsequently teachers did not see it as meaningful. Second, it could be hypothesized that the educational innovation was not trivial, yet teachers failed to comprehend its meaning. In the former case, since the change was unimportant, teachers were most probably trying to adapt the new identities required by the educational innovation into their existing teacher identities, and, thus, were in a state of assimilation (Luttenberg et al., 2013). In the latter case, teachers rejected the new ideas regarding the teacher identity proposed by the educational innovation, and, thus, they were in a state of distantiation (Luttenberg et al., 2013).

Add to that, the outcomes signify that teachers' increased ownership towards the educational innovation went together with an increased understanding of the need to expand their knowledge and teaching methods in the discipline as well as prepare more for teaching

the subject matter. Although there are no studies that connect teachers' sense of ownership or achievement of agency with their perceptions regarding discipline knowledge or teaching methods, it seems logical to assume that since an increased sense of ownership leads teachers to devote time and energy in the educational innovation (Ketelaar et al., 2014), then they are more inclined to invest more time in preparation for teaching the subject matter.

Conceptions of doing – technological teaching – are positively correlated to all three variables, but at different levels. The relationship with sense-making is the strongest one with shared variance at 18.2%, next is the relationship with ownership at 15.3%, and last the relationship with agency at 9.2%. The average shared variance is 14.2%.

Therefore, the more teachers integrated technology into classroom activities the more they understood the meaning of the educational innovation and vice versa. This relationship is an exemplar of how teacher identity development occurs through teacher actions in synergy with an increased understanding of the proposed teacher identity.

Similarly, the more teachers perceived ownership towards the educational innovation and achieved agency, the more they tried to integrate technological tools in their teaching and vice versa. This outcome could be considered related to teachers' perceptions of being regarding the pedagogical domain and their understanding that they need to change their teaching methods.

Conceptions of doing and having - pedagogical activities and teachers' needs domain – demonstrate the highest average shared variance with ownership, sense-making, and agency. Relationships with sense-making and ownership are over 30% and relationship with agency is nearly 24%. The average shared variance is approximately 29%.

Therefore, the more teachers implemented pedagogical activities related to the educational innovation and received positive feedback from the students, the more they made sense of the educational innovation, and vice versa. It could be argued that this relationship accommodates all three MoE, since, besides doing and having, includes the cognitive understanding, that is being. In this sense it is a prominent example of how the triple synergy of cognitive thinking, actions, and feedback from the environment work jointly towards the development of the teacher's identity.

Similarly, the more teachers achieved agency and implemented activities for the educational innovation the more they felt that these activities helped them to achieve their pedagogical goals which increased their sense of ownership towards the educational innovation. Again, this is in line with the results of the study by Ketelaar et al. (2014), where it was revealed that when teachers feel that the educational innovation is important for them and their students their sense of ownership towards the educational innovation is increased.

Lastly, conceptions of having – needs related to the school dimension - are positively correlated only with ownership and sense-making. The relationship with ownership is the strongest one with shared variance at nearly 22%, while the relationship with sense-making is over 11%. The average shared variance (including agency) is 12%.

Thus, the more teachers received support and collaborated with their colleagues and school administration, the more they perceived ownership towards the educational innovation. This outcome highlights how critical the collaboration among teachers as well as the support from the administration is for the success of an educational innovation. In the same vein, Le Fevre (2014) concludes that a supportive school environment is a requisite if teachers are to take the risk and implement an educational innovation.

Similarly, the more teachers received support and collaborated with their colleagues and the school administration, the more they made sense of the educational innovation and vice versa. Thus, it appears that the support teachers received from the environment facilitated their sense-making process, which in turn cultivated in-school collaboration among teachers. This outcome corroborates to the view that collegial support networks influence important aspects of a teacher's identity (Laura Thomas et al., 2019), while also shows how working with colleagues can increase opportunities for learning and identity development (Kennedy, 2011).

6.6.4. What are the Differences Among Clusters of Teachers When Considering Components of the Teacher-Inquirer Identity?

The fourth research question is broken down to four sub-questions. The first sub-question is related to the different teacher profiles based on their inquiring skills. The second sub-question is related to differences between the different teacher profiles regarding the information literacy skills they have. The third sub-question is related to differences between the different teacher profiles regarding perceptions of ownership, sense-making, and agency. Lastly, the fourth sub-question is related to differences between the different teacher profiles regarding perceptions of being, doing, and having.

What are the Different Teacher Profiles Based on Their Inquiring Skills?

As explained in the methodology, the number of clusters was determined through five different methods.

First, the dendrogram showed that from a two-cluster solution to a one-cluster solution the distance is greatly increased and from a three-cluster solution to a two-cluster solution the distance is important as well. Therefore, a two-cluster solution is primarily suggested, but, perhaps, a three-cluster solution is good as well.

Second, the scree plot does not show a clear elbow, although we can observe that there is a sharp increase when switching from a two-cluster solution to one-cluster solution and less sharp one when switching from a three-cluster to a two-cluster solution. Therefore, a two-cluster solution is suggested, but also a three-cluster solution may be good as well.

Third, the ω_k statistics for a three-, four-, and five-cluster solution was calculated and it was revealed that the minimum ω_k results for a five-cluster solution.

At this point, since there was no clear indication from the different methods as regards the number of clusters, the five-, four-, three-, and two-cluster solutions were tested. The five- and four-cluster solutions produced clusters with few items (less than 10), therefore they were rejected. In contrast, both the three- and the two-cluster solutions produced outcomes that had a sufficient number of items in each cluster. Hence, it was decided to continue with a three-cluster solution as it could offer richer outcomes than the two-cluster solution.

Next, the cluster centers produced by the Ward's Method were tested by utilizing the k-means procedure and it was found very high degree of agreement and overlap. More specifically, two of the centers have not changed at all, the highest percentage change in cluster centers is less than 5%, and the average percentage change in cluster centers is merely 2%. What is more important, however, is that the nature of the centers remained almost intact. When the objects' cluster affiliations were contrasted using crosstabs it was found that the two analyses have an overlap of over 90%, which is very satisfactory as less than one tenth of all items appear in a different cluster when using the k-means procedure.

Lastly, the resulted outcome satisfied the criteria of substantiality, parsimoniousness, interpretability, and predictive validity to a large extent. Hence, the smallest cluster contains 30 items, which is a sufficient amount especially for a sample of 111 items. Therefore, the

three-cluster solution is parsimonious enough, allows prediction of the related variables, and it can be logically explained as it is discussed next.

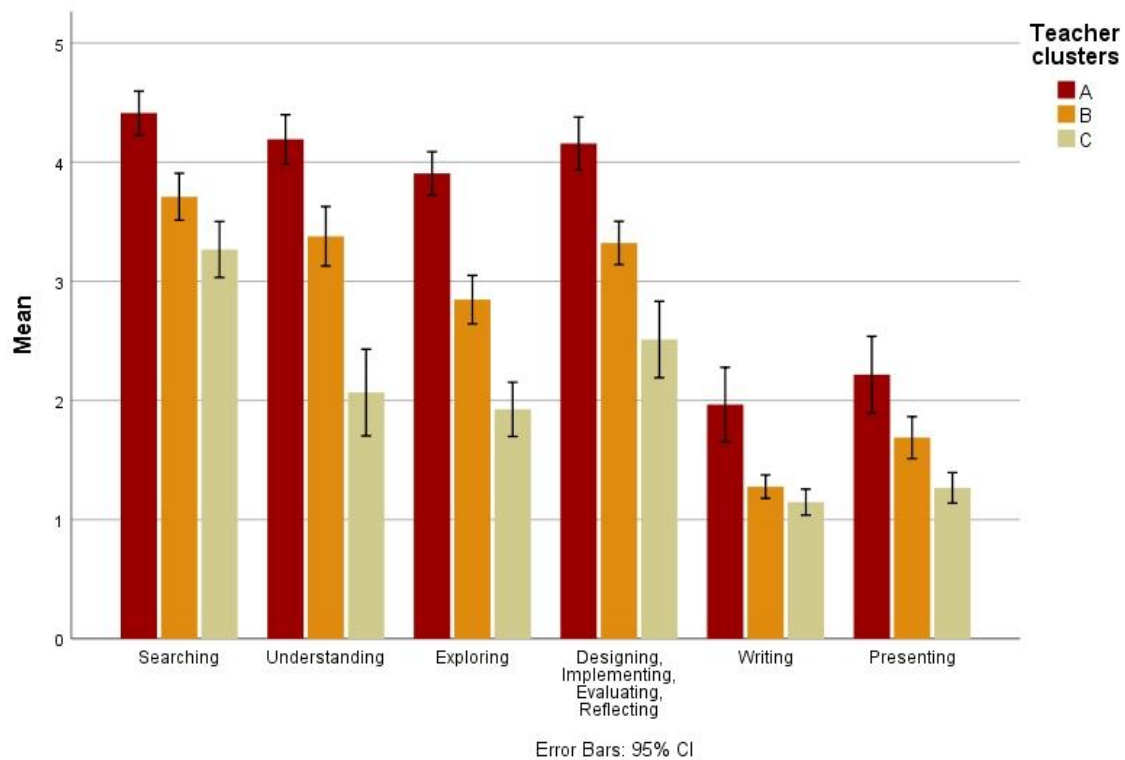
As can be seen in Table 16, all 18 associations are marked statistically significant based on Mann-Whitney U test. What is more, in 15 out of the 18 comparisons (83%) the effect size is high, which signifies that the different clusters are accountable for much of the variability. The results from the Mann-Whitney U test show that the three clusters are clearly distinguishable in all variables and can be indisputably ordered from high to low (see Figure 1). Hence, cluster A has the highest mean in all inquiry variables and cluster B has higher mean values compared to cluster C.

Table 16: Differences between the three clusters of teachers (A, B, and C) in inquiry skills.

	A (n=34) M (SD)	B (n=47) M (SD)	C (n=30) M (SD)	Statistical significance and effect size
Searching	4.41 (0.53)	3.71 (0.67)	3.27 (0.63)	$A^{be} > B, C$ $B^{ad} > C$
Understanding	4.19 (0.59)	3.38 (0.85)	2.07 (0.97)	$A^{be} > B, C$ $B^{be} > C$
Exploring	3.90 (0.52)	2.85 (0.69)	1.93 (0.61)	$A^{be} > B, C$ $B^{be} > C$
Designing, Implementing, Evaluating, Reflecting	4.16 (0.63)	3.32 (0.62)	2.51 (0.86)	$A^{be} > B, C$ $B^{be} > C$
Writing	1.96 (0.90)	1.28 (0.34)	1.15 (0.29)	$A^{be} > B, C$ $B^{ac} > C$
Presenting	2.22 (0.92)	1.69 (0.60)	1.27 (0.34)	$A^{ad} > B$ $A^{be} > C$ $B^{ae} > C$

^a $p < 0.05$; ^b $p < 0.01$; ^c $\eta^2 > 0.01$; ^d $\eta^2 > 0.06$; ^e $\eta^2 > 0.14$

Figure 1: Clustered bar chart displaying the means for the cluster solution of the teachers across the inquiry skills.



It can be observed that in the first four inquiry skills (searching, understanding, exploring, and designing, implementing, evaluating, reflecting), the average means of clusters A, B, and C are approximately 4, 3, and 2 accordingly. As regards writing and presenting, it should be reminded that the difference between level 2 and 1 is that the former signifies that the teachers wrote a text or presented their work, whereas in the latter that they did not. Hence, it can be observed that teachers in cluster A wrote a text and presented their work, few teachers in cluster B wrote a text, but the majority presented their work, and few teachers in cluster C presented their work and even fewer wrote a text.

Taken the above into account, teachers who form clusters A, B, and C could be labeled as having practiced inquiry skills to a *high*, *medium*, and *low* degree accordingly in light of an educational innovation. In terms of the teacher-inquirer identity, it could be argued

that it is developed to a high degree in teachers in cluster A, medium degree in teachers in cluster B, and low degree in teachers in cluster C.

What are the Differences Among Clusters of Teachers When Considering Information Literacy and English Language Skills?

The three clusters did not differ significantly in English language skills and only one statistically significant relationship emerged in information literacy skills (Table 17). Overall, all three clusters demonstrate high or very high information literacy and English language skills.

Table 17: Differences between the three clusters of teachers (A, B, and C) in information literacy and English language skills.

	A (n=34) M (SD)	B (n=47) M (SD)	C (n=30) M (SD)	Statistical significance and effect size
Information literacy skills	4.68 (0.42)	4.38 (0.52)	4.46 (0.55)	A ^{ad} > B
English language skills	4.29 (0.84)	4.09 (0.88)	4.40 (0.81)	-

^a $p < 0.05$; ^b $p < 0.01$; ^c $\eta^2 > 0.01$; ^d $\eta^2 > 0.06$; ^e $\eta^2 > 0.14$

Although it could be claimed that this outcome demonstrates that English language skills are not important towards the development of the teacher-inquirer identity, it should be accounted that in all three clusters the average in English language skills was above the advanced level.

With reference to information literacy skills besides a moderate effect size difference between clusters A and B with teachers in cluster A reporting, on average, higher information literacy skills no other difference emerged. Therefore, while teachers in cluster A reported higher information literacy skills than teachers in cluster B, no difference was found in

information skills between teachers in clusters A and C, neither between teachers in clusters B and C.

As it has been shown, teachers in cluster A have practiced their inquiry skills, and, thus, developed their teacher-inquirer identity, to a higher degree compared to teachers in the other clusters, so it is reasonable to expect that they would have also higher information literacy skills. However, the results only partially give evidence for this assumption. For interpreting this outcome, the rather high level of information literacy skills that teachers from all three clusters reported should be also taken into account. In other words, it is difficult to find differences between clusters when the average in information literacy skills was well above the high level in all three clusters.

What are the Differences Among Clusters of Teachers When Considering Their Perceptions of Ownership, Sense-Making, and Agency?

Overall, statistically significant differences were found between the three clusters in ownership and sense-making, whereas in agency only one statistical significant difference emerged (Table 18). The results are analysed in more detail in the following paragraph.

Table 18: Differences between the three clusters of teachers (A, B, and C) in ownership, sense-making, and agency.

	A (n=34) M (SD)	B (n=47) M (SD)	C (n=30) M (SD)	Statistical significance and effect size
Ownership	4.63 (0.44)	4.07 (0.68)	3.72 (0.73)	$A^{be} > B, C$ $B^{ad} > C$
Sense-making	4.74 (0.36)	4.19 (0.75)	3.76 (0.82)	$A^{be} > B, C$ $B^{ad} > C$
Agency	4.35 (0.63)	4.06 (0.79)	3.88 (0.88)	$A^{ad} > C$

^a $p < 0.05$; ^b $p < 0.01$; ^c $\eta^2 > 0.01$; ^d $\eta^2 > 0.06$; ^e $\eta^2 > 0.14$

On average, teachers in cluster A reported very high ownership and very high sense-making, whereas teachers in cluster B high ownership and sense-making and teachers in cluster C close to high ownership and sense-making (moderate-high effect size).

The three clusters can be ordered from very high (cluster A) to close to high (cluster C) in terms of ownership and sense-making. Hence, teachers in cluster A perceived very high ownership towards the educational innovation, teachers in cluster B high ownership, and teachers in cluster C lower than high ownership. Similarly, teachers in cluster A made sense of the educational innovation to a very high extent, teachers in cluster B to a high extent, and teachers in cluster C to a lower than high extent.

Therefore, it could be argued that ownership and sense-making are rather important for determining the extent to which a teacher will develop the teacher-inquirer identity. It is also important to highlight that even teachers in cluster C who developed the teacher-inquirer identity to a low extent reported quite high ownership and sense-making. This indicates that teachers may need first to experience quite high ownership towards, and sense-making of, the educational innovation for the development of their teacher-inquirer identity.

As regards agency, teachers in cluster A reported above high agency, whereas teachers in cluster C close to high agency (moderate effect size). Teachers in cluster B reported lower agency on average compared to teachers in cluster A and higher agency compared to teachers in cluster C, yet neither of the two relationships was statistically significant. Taking into account that teachers in cluster C reported close to high agency, it appears that achievement of agency to a quite high extent is crucial for the development of the teacher-inquirer identity, though it limitedly affects the extent to which this will happen, that is to a low, medium, or high extent.

What are the Differences Among Clusters of Teachers When Considering Their Perceptions of Being, Doing, and Having?

Overall, statistically significant differences were found between the three clusters in conceptions of being, doing and having (Table 19). From the total 18 relationships 14 are marked statistically significant based on Mann-Whitney U test (78%) and nearly all have a moderate or high effect size. In general, cluster A demonstrates the highest mean in being, doing, and having, next follows cluster B, and cluster C shows the lowest mean. In addition, in all MoE a statistically significant difference was found between teachers in clusters A and C. The findings are presented in more detail in the paragraphs that follow.

Table 19: Differences between the three clusters of teachers (A, B, and C) in perceptions of being, doing, and having.

	A (n=34) M (SD)	B (n=47) M (SD)	C (n=30) M (SD)	Statistical significance and effect size
Being - pedagogical	4.41 (0.71)	4.11 (0.72)	3.51 (0.78)	$A^{ac} > B$ $A^{be} > C$ $B^{ae} > C$
Being - management of change	4.01 (0.86)	3.62 (0.81)	3.57 (0.87)	$A^{ad} > B, C$
Being - disciplinary	3.48 (1.22)	3.37 (0.91)	2.65 (1.09)	$A^{bd} > C$ $B^{ad} > C$
Doing – technological	4.15 (0.88)	3.57 (0.83)	3.09 (1.19)	$A^{bd} > B$ $A^{be} > C$
Doing and Having – pedagogical activities and teachers' needs	4.65 (0.45)	4.10 (0.63)	3.79 (0.86)	$A^{be} > B, C$
Having - needs related to the school	3.71 (0.93)	2.98 (1.02)	2.53 (0.96)	$A^{ad} > B$ $A^{be} > C$ $B^{ac} > C$

^a $p < 0.05$; ^b $p < 0.01$; ^c $\eta^2 > 0.01$; ^d $\eta^2 > 0.06$; ^e $\eta^2 > 0.14$

With reference to conceptions of being regarding the pedagogical domain, it was found that teachers in clusters A, B, and C reported very high, high, and above medium accordingly.

Regarding conceptions of being in the management of change domain, teachers in cluster A reported high conceptions, whereas teachers in clusters B and C over medium. Thus, there are clear differences among the three clusters of teachers in terms of how they perceived their teacher identity in the pedagogical domain and, evidently, this affected the extent to which their teacher-inquirer identity was developed. Accordingly, it seems that more than a medium understanding of the need to manage the change due to the educational innovation is required for the development of the teacher-inquirer identity. Besides that, a higher understanding of the need to manage the change appears to have only narrow effects on the development of the teacher-inquirer identity.

In the disciplinary domain of being, teachers in clusters A and B reported over medium perceptions, whereas teachers in cluster C below medium. Hence, for the development of the teacher-inquirer identity it could be argued that just a below the medium level understanding of the need to expand the disciplinary knowledge and related teaching methods is required. What is more, bearing in mind that even teachers who developed their teacher-inquirer identity to a high degree did not reach a high level of understanding in this domain of being, this outcome may indicate that teachers had already an increased understanding of this need, that is before getting engaged with the innovation. Likewise, it could be assumed that the engagement with the educational innovation did not create additional or exceptional needs in this domain and, subsequently, teachers did not experience the need to expand the disciplinary knowledge and related teaching methods to a higher degree.

In terms of teachers' perceptions of doing regarding the technological activities in classroom teaching, it was found that teachers in cluster A reported high conceptions, whereas teachers in clusters B and C over medium. Thus, it appears that integration of technological tools in teaching to a medium extent at least is necessary for the

implementation of the educational innovation and the development of the teacher-inquirer identity.

With reference to teachers' perceptions of doing and having - pedagogical activities and teachers' needs – it was found that teachers in cluster A reported very high conceptions, whereas teachers in clusters B and C high. The small differences among the clusters as well as the high overall value in all three clusters demonstrate that teachers' perceptions of doing and having regarding their pedagogical activities and needs play a crucial role in the development of the teacher-inquirer identity.

Lastly, as regards teachers' conceptions of having in the domain of the needs related to the school, it was found that teachers in clusters A, B, and C reported over medium, medium, and low accordingly. Hence, there were clear differences among the three clusters of teachers in terms of how they perceived their needs related to the school. This outcome highlights the vital role of support from colleagues and the administration for the development of the teacher-inquirer identity, since the level of support received determined the degree of development of the teacher-inquirer identity. Whereas it appears to be difficult for teachers to get as far as a high level of support, including teachers who have developed their inquiry skills to a very high degree, even a low level of support is obviously necessary for the development of the teacher inquirer identity.

6.7 Synopsis

In this chapter the research settings, methods, and instruments utilized in the first study of the thesis were presented and the corresponding findings were reported.

Data Collection and Demographics

The questionnaire on teachers' perspectives regarding inquiry was shared on teachers' groups on social media and on special interest online groups and teachers who actively

develop innovative projects with their classes were requested to fill it in. In total, 111 Greek in-service teachers completed the questionnaire. More than half of the respondents were working in primary education and more than one-third in secondary education. More than half of the respondents were instructor specialists (i.e. math teacher, language teacher, etc.) and nearly half were primary and kindergarten teachers. Nearly half of the respondents were between 41 and 50 years old, whereas the other half were almost equally distributed over and below this age period. Respondents had at least 3 years of teaching experience, while the average respondent had 18 years of teaching experience. All respondents reported that they had participated in a professional development opportunity during the last three years and practically all respondents reported that they had at least intermediate level in English. According to information from statistical services, the teachers' sample is quite representative of the population of Greek in-service teachers in terms of gender, age, and specialization.

As regards the educational innovation, the topic was usually related to humanities, socio-political sciences, and natural sciences, while there were some on new technologies and STEM and culture. The duration of the educational innovation ranged vastly, yet the typical educational innovation was implemented in approximately 7-12 months.

Questionnaire

In addition, topics and issues considered during the design and construction of the questionnaire were briefly discussed. As regards sampling methods, judgmental sampling was chiefly utilised for selecting the participants.

The questionnaire included six measures on concepts related to the topic of the thesis. More specifically, the questionnaire included measures on: information literacy skills; ownership; sense-making; agency; being, doing, and having MoE with reference to a pedagogical innovation; inquiry skills when an educational innovation is implemented by

teachers. The construction of the questionnaire was completed through five stages (creation of items, review and addition of items, review and refinement, translation into Catalan and Spanish).

PCA

The PCA procedure for extracting the main components from each measure is described before reporting the outcomes of the PCA for each measure. More specifically, the following components emerged from the measures:

- information literacy skills;
- ownership;
- sense-making;
- agency;
- being – pedagogical domain;
- being – management of change domain;
- being – disciplinary domain;
- doing – technological activities in classroom teaching domain;
- doing and having – pedagogical activities and teachers' needs domain;
- having – needs related to the institution domain;
- inquiry skills: searching for problems;
- inquiry skills: understanding a problem;
- inquiry skills: exploring solutions to a problem;
- inquiry skills: designing, implementing, evaluating, and reflecting;
- inquiry skills: writing;
- inquiry skills: presenting.

Findings

Teachers reported high information literacy skills, though there was a quite high variation in their responses. Add to that, they had participated at least to some extent to professional development opportunities during the last three years. In light of an educational innovation, teachers confirmed that they practiced their inquiry skills at least to some extent.

There was minimal correlation between information literacy and inquiry skills, while English language and inquiry skills were not correlated. On the whole, there was a positive correlation between ownership, sense-making, agency and inquiry skills as well as between perceptions of being, doing, having and inquiry skills.

No correlation was found between information literacy skills, English language skills, and teachers' perceptions of being, doing, and having. On the other hand, there was a positive correlation between conceptions of ownership, sense-making, and agency and conceptions of being, doing, and having.

The different clustering methods showed a three-cluster solution. The three clusters are clearly distinguishable and can be indisputably ordered from high to low. Thus, cluster A showed the highest mean in all inquiry skills and cluster B showed higher mean values compared to cluster C.

There were minimal differences between the three clusters in English language and information literacy skills.

The three clusters can be ordered from high to low in ownership and sense-making ($A > B > C$), whereas in agency only one significant difference emerged ($A > C$).

With reference to conceptions of being, in the pedagogical domain the three clusters can be ordered from high to low ($A > B > C$), in the management of change domain cluster A

showed higher values from the other two clusters ($A > B, C$), and in the disciplinary domain cluster C showed lower values from the other two clusters ($A, B > C$).

As regards conceptions of doing – technological activities in the classroom domain, cluster C showed lower values from the other two clusters ($A, B > C$).

Regarding conceptions of doing and having – pedagogical activities and teachers' needs domain, cluster A showed higher values from the other two clusters ($A > B, C$).

Lastly, with reference to conceptions of having – needs related to the school domain, the three clusters can be ordered from high to low ($A > B > C$).

7. Second Study: Student-teachers' Perspectives Regarding Inquiry

7.1. Introduction

This chapter adopts the same format and structure with the preceding chapter. Likewise, this chapter has a twofold aim. First, to present the research settings, methods, and instruments utilized in the second study of the thesis, and, second, to report the corresponding findings.

The chapter begins with a description of the data collection and presentation of participants' demographics. Next, the structure of the questionnaires, the design of the instruments, the construction process, and the response scales are reported. What follows is the PCA. After that, the findings of the first study are reported. The chapter concludes with a synopsis of the research settings and the major findings. Lastly, the survey on student-teachers' perspectives regarding inquiry can be found at Appendix C.

7.2. Data Collection

Data from student-teachers were collected from three student cohorts in July 2019 and another three student cohorts in February 2020. The questionnaire on student-teachers' perspectives regarding inquiry was emailed a few days after the deadline for the presentation of the thesis to the committee and a reminder was sent a few weeks after the first email.

7.3. Student-teachers' Sample

The questionnaire on student-teachers' perspectives regarding inquiry was sent to 1239 students of three online postgraduate programmes (education and ICT, psychopedagogy, and learning difficulties) who attended the TFM (master thesis project) at the Universitat Oberta de Catalunya (UOC) during academic years 2019-2020.

In total, 154 students, 125 females (81.2%) and 29 males (18.8%), responded to the questionnaire (response rate 12.4%).

Approximately four out of ten of the respondents were aged between 21-30, another four out of ten between 31-40, and more than two out of ten over 40.

The gender and age characteristics of the respondents are presented in Table 20.

Table 20: Student-teachers' gender and age

Demographics	n	%
Gender		
Female	125	81.2%
Male	29	18.8%
Age		
21-30	59	38.3%
31-40	61	39.6%
41-50	22	14.3%
51-60	12	7.8%

Nearly one fourth of the respondents had a degree in education, one fifth in infant education, and another one fifth in a specialized area (e.g. music, sociology, physical exercise, philology, etc.). Approximately one out of ten had a degree in psychology and in special education.

Lastly, a significant part of the respondents did not specify the title of their bachelor degree.

Respondents' education demographics are presented in Table 21.

Table 21: Student-teachers' education demographics

Education Demographics	n	%
Bachelor area		

Psychology	21	13.6%
Education	37	24.0%
Infant Education	31	20.1%
Special Education	13	8.4%
Specialist Education	31	20.1%
Unspecified	21	13.6%

Over four out of ten of the respondents reported advanced or higher English language level, four out of ten intermediate, and less than one-fifth elementary or lower. According to Eurostat nearly four out of ten workers in EU aged 25-64 with a tertiary education level reported that they were proficient in their best-known foreign language (Eurostat, 2019). Obviously, a direct comparison cannot be made for it is not known their level in the English language while in this study participants were not asked to report their knowledge of other foreign languages. Still, it seems that student-teachers studying online at the UOC have quite lower level in English language compared to the EU average. More details about respondents' level in English are presented in Table 22.

Table 22: Student-teachers' English language level

English language level	n	%
Elementary	26	16.9%
Intermediate	62	40.3%
Advanced	50	32.5%
Proficient	16	10.4%

There was a quite wide diversity with reference to respondents' profession. Approximately two out of ten of respondents were working as: a nursery or kindergarten teacher, a primary school or special education teacher, a secondary or specialist teacher. One

out of four were working in a psycho-pedagogical orientation, while the rest one fourth of the respondents were not working at the time or they were working in a position not relevant with education or psychology.

The vast majority of the respondents (n=144; 93.5%) had working experience and/or they were working at the time. Two-thirds of the respondents had working experience between 4 and 19 years, one-sixth less than four years working experience and another one-sixth more than 19 years working experience. On average respondents had nine years of working experience.

More details about respondents' profession and working experience are presented in Table 23.

Table 23: Student-teachers' profession and working experience

Profession demographics	n	%
Profession		
Nursery/kindergarten teacher	24	15.6%
Primary school or special education teacher	34	22.1%
Secondary school or specialist teacher	23	14.9%
Psycho-pedagogical orientation	37	24.0%
Unemployed or working in a non-educational area	36	23.4%
Working experience		
No working experience	10	6.5%
Less than 3 years	23	14.9%
4-9 years	56	36.4%
10-19 years	42	27.3%
20 years or more	23	14.9%

Nearly half of the respondents were attending the learning difficulties programme, one fourth the psychopedagogy and another one fourth the education and ICT.

As regards the type of the thesis, more than four out of ten of the respondents conducted and evaluated an educational or psychoeducational intervention, nearly four out of ten conducted empirical work, and nearly two out of ten (16%) conducted an educational or psychoeducational intervention.

Lastly, as regards their experience in doing work related to a master thesis, nearly half of the respondents had completed a graduate thesis and another one out of five a master thesis, while less than one-fifth of the respondents reported having no previous experience in doing activities similar to those requested in a thesis project.

More details about respondents' postgraduate studies and experience in conducting inquiry activities are presented in Table 24.

Table 24: Student-teachers' postgraduate studies and experience in conducting inquiry activities

	n	%
Title of the postgraduate programme		
Education and ICT	41	26.6%
Psycho-pedagogy	41	26.6%
Learning difficulties	72	46.8%
Type of the thesis		
Research (empirical work, collecting and analyzing data)	55	35.7%
Research (An educational or psychoeducational intervention has been carried out and data has been collected for research purposes)	24	15.6%
Professionalization (An educational or psychoeducational intervention has been carried out and evaluated)	63	40.9%
Other	12	7.8%

Experience in conducting research

No previous experience	23	14.9%
Some to sufficient previous experience doing a specific task of a TFM	34	22.1%
I have done a TFG previously	69	44.8%
I have done another TFM previously	28	18.2%

7.4. Questionnaire on Student-teachers' Perspectives Regarding Inquiry

The questionnaire on student-teachers' perspectives regarding inquiry is comprised of 8 sections and a total of 149 questions (see Appendix C).

The first section collects participants' demographics. The second section collects data about the master thesis and participants' previous research experience. In the third section data about participants' information literacy, research, and professional skills are collected. The fourth section gathers data about participants' inquiry skills during the master thesis. The fifth section collects data about emotions experienced during the master thesis. The sixth section gathers data about participants' sense of ownership, sense-making, and agency with reference to the master thesis. In the seventh section participants' perceptions regarding knowledge and skills they developed while doing their master thesis are collected. In the eighth section participants' perceptions regarding the support they received while doing their master thesis are collected.

7.4.1. Design of the Instruments

The instrument on information literacy skills was created based on the computer and information literacy framework by Fraillon et al. (2013). The instrument with reference to the inquiry skills while conducting a master thesis was created based on the teacher-inquirer model. The instrument on emotions was created based on the outcomes of the studies on teachers' emotions and teachers' emotional experiences in professional development by

Taxer and Frenzel (2015) and Gaines et al. (2019) accordingly. The instrument on inquiry skills when an educational innovation is implemented by the teachers was created based on the teacher-inquirer model. The instruments on ownership, sense-making, and agency were created based on two empirical studies by Ketelaar and her colleagues on teachers' perceptions of ownership, sense-making, and agency when a new pedagogy or innovation is implemented (Ketelaar et al., 2012, 2014).

7.4.2. Construction of the Questionnaire

The questionnaire was constructed and refined through four stages. Initially, the researcher crafted a number of question items for each one of the instruments taking into account the questionnaire on teachers' perspectives regarding inquiry. Next, the supervisor reviewed the question items and added a few question items as well. Thereafter, the final list of items was reviewed by both the researcher and the supervisor and any ambiguous item was discussed and subsequently rewritten or deleted. Lastly, the questionnaire was translated into Spanish and Catalan by the supervisor.

7.4.3. Response Scales

In the instruments regarding information literacy, research, and professional skills the response scale is a 5-point scale ranging from 'very low' (1) to 'very high' (5). In the instrument related to inquiry skills the response scale ranges from 'I don't know the meaning of this task' (1) to 'I did this task very well' (5). In the instrument related to the experienced emotions, the response scale is a 5-point scale ranging from 'never' (1) to 'very often' (5). In the instruments on ownership, sense-making, and agency, the instrument regarding the knowledge and skills that participants developed as well as in the instrument regarding the support they received while doing their master thesis the response Likert scale ranges from 'strongly disagree' (1) to 'strongly agree' (5).

7.5. PCA

7.5.1. Information Literacy Skills

Student-teachers were asked to report on their conceptions of their information literacy skills based on an instrument of 7 items. In the first PCA an item ('Using information safely and securely (e.g. using strong passwords, knowing ways to protect private information)') showed low value in communality (0.307) and it was checked whether its removal improves the results.

After the removal of this item both the total variance explained and the Cronbach alpha increased. Nevertheless, the total variance explained remained low (below 60%), so it was checked whether the removal of another item would improve its value.

After removing the item with the lowest communality value ('Accessing and evaluating the information on the web (e.g. selecting information from a website and verifying the veracity of information)'), the PCA showed an adequate one-component structure (KMO=0.812 and a significant Bartlett test, $p<0.000$), explaining 58.82% of the total variance with factor loadings ranging from 0.740 to 0.794. The instrument showed good reliability, with a Cronbach's α of 0.825.

7.5.2. Research Skills

Student-teachers were asked to report on their conceptions of their research skills based on an instrument of 6 items. In the first PCA an item ('Building your knowledge about a topic (e.g. finding and reading research articles)') showed low value in communality (0.469) and it was checked whether its removal improves the results.

After the removal of this item, PCA showed an adequate one-component structure (KMO=0.868 and a significant Bartlett test, $p<0.000$), explaining 66.48% of the total

variance with factor loadings ranging from 0.762 to 0.845. The instrument showed good reliability, with a Cronbach's α of 0.874.

7.5.3. Professional Skills

Student-teachers were asked to report on their conceptions of their professional skills based on an instrument of 5 items. The PCA showed an adequate one-component structure (KMO=0.815 and a significant Bartlett test, $p<0.000$), explaining 65.54% of the total variance with factor loadings ranging from 0.798 to 0.838. The instrument showed good reliability, with a Cronbach's α of 0.868.

7.5.4. Ownership

Student-teachers were asked to report on their conceptions of ownership related to the TFM based on an instrument of 5 items. The initial PCA showed a two-component solution: the first three items loaded in the first component, the fourth in both factors (but more in the second), and the last one in the second factor. Since only two items were loaded in the second component, the item ('I have the intention to continue in the future the work initially developed in the TFM') which loaded only in the second component was removed. After the removal of that item the PCA showed an adequate one-component structure (KMO=0.742 and a significant Bartlett test, $p<0.000$), explaining 61.21% of the total variance. Since the variance was a bit low, it was examined whether further removal of items will improve the outcomes. The item ('I shared my TFM with others') with the lowest communality (0.472) was removed.

After this removal, the PCA showed an adequate one-component structure (KMO=0.657 and a significant Bartlett test, $p<0.000$), explaining 70.12% of the total variance with factor loadings ranging from 0.815 to 0.856. The instrument showed acceptable reliability, with a Cronbach's α of 0.785.

7.5.6. Sense-making

Student-teachers were asked to report on their conceptions of sense-making related to the TFM based on an instrument of 5 items. PCA showed an adequate one-component structure (KMO=0.853 and a significant Bartlett test, $p<0.000$), explaining 70.24% of the total variance with factor loadings ranging from 0.815 to 0.856. The instrument showed good reliability, with a Cronbach's α of 0.853.

7.5.7. Agency

Student-teachers were asked to report on their conceptions of agency related to the TFM based on an instrument with 15 items.

The initial PCA showed a complex solution. Four components emerged, yet the total variance explained was quite low (58.64%) for such an increased number of components. The items did not seem to be correlated, so varimax rotation was preferred. The resulted four-component solution was not good since two factors had only 2 or 3 items and there were 3 items that did not load adequately in any factor. The communalities table confirmed that there were some items that did not fit, therefore the item with the lowest communality ('I feel more comfortable doing typical master's courses than having to develop a TFM') was removed.

The second PCA demonstrated the same issues. The total variance explained increased to 61.24%, yet still, four factors emerged, and some of them had very few items and unclear loadings. One item ('The successes and failures of the TFM were more due to my choices instead of external factors') did not load adequately to any factor, and the communalities table confirmed that it did not fit well. Therefore, it was removed.

The situation did not change much in the third PCA. The total variance explained increased to 63.14%, yet still four factors emerged while two of them had only two items. The scree plot indicated that only two components should be extracted.

Therefore, a PCA was conducted with forced two components. However, the result in the total variance explained was disappointing (42.56%). Furthermore, three items did not load to any component and their community value was excessively low (<0.200).

A PCA was conducted in order to test whether a three-component structure fits better. The total variance explained increased (53.80%), yet the third factor had only three items and one item had a load of less than 0.500. Additionally, two items had low loadings into the first component (<0.550).

Therefore, it was decided to continue the analysis with two components only and continue removing items that did not fit. The items seemed to be correlated, therefore the oblimin rotation was preferred for the following analyses. Five items ('The successes and failures of the TFM were more due to my choices instead of external factors', 'I performed the minimum activities required for the TFM', 'I devoted more time and energy than what was actually required to develop the TFM', 'Most of the time I had to accommodate to the suggestions of the UOC professor instead of developing my ideas', 'I was able to organize the best conditions for me (family, work, time availability, etc.) to develop my TFM correctly') were gradually removed as they had low value in communalities ($<.300$) and did not load adequately in any component.

After removing these items, the PCA showed an adequate two-component structure, yet the total variance explained was quite low (60.63%), therefore it was decided to examine whether it could be improved with further elimination of items. Two items ('Most of the time I had high active participation in the development of my TFM', 'The requirements of the TFM fit well with the way I currently act as a student') that showed low loadings and communalities ($<.400$) were gradually removed.

The final PCA showed an adequate two-component structure (KMO=0.687 and a significant Bartlett test, $p < 0.000$), explaining 64.91% of the total variance. The rotated factor solution (Oblimin with Kaiser normalization) provided factor loadings ranging from 0.689 to 0.906 and from 0.759 to 0.851. Both instruments showed acceptable reliability with a Cronbach's α of 0.797 and 0.747 respectively.

The first component contained four items: 'I have been able to decide (without any inference from anyone) the theme of my TFM', 'In general, it was me who took the main decisions regarding the development of the TFM', 'I had the opportunity to develop the design part of my TFM (research or professional) as I originally planned', 'I was able to develop the practical aspects of the TFM as I initially had in mind'. This component can be called '*Influence on one's work*'.

The second component contained three items: 'I have tried to improve my learning skills to adequately respond to the requirements of the TFM', 'After having completed my TFM I feel that I have become a better student to do a professional intervention', 'The TFM has significantly changed the way that I view myself as a student'. This component can be called '*Negotiation of student identity*'.

7.5.8. Inquiry Skills

Student-teachers were asked to report on their conceptions of inquiry skills related to the TFM based on an instrument with 42 items.

The initial PCA showed a complex solution of eight components explaining 67.49% of the total variance. There were some correlations among the components, therefore the oblimin rotation was preferred. The loadings were difficult to be interpreted, therefore it was decided to reduce the components to seven for clarifying the structure.

The PCA with a forced seven-component solution showed the same problems. Again, it was decided to reduce the components for clarifying the structure.

The PCA with a forced six-component solution showed promising results, but when this path was explored further with elimination of items with low communality and low factor loadings it resulted to a complex structure with cross loadings and one component with few items which, moreover, loaded into other factors as well. Again, it was decided to reduce the components for clarifying the structure.

The PCA with a forced five-component solution showed a clearer structure than the previous one. The total variance explained was low (58.50%), yet the KMO value was meritorious (0.870). It was explored whether by eliminating items with low communality and unclear and/or low loadings will improve the structure.

Therefore, in the subsequent analyses the following items with communalities lower than 0.500 were gradually removed: 'Listing relevant topics and interests to your profession or listing topics that you would like to research', 'Specifying in an operational way the research aims or the aims of the professional intervention', 'Reducing the list of topics to a choice of 2-3 topics', 'Asking the opinion of others (e.g. tutors, colleagues, peers, friends) about your initial ideas', 'Identifying the purpose of your TFM', 'Formulating research questions or professional intervention questions about the chosen topic', 'Sending the TFM document before submission to others (e.g. peers, friends) and asking for feedback', 'Discussing with your colleagues about the topic (e.g. with your classmates)', and 'Evaluating the viability of the TFM on the chosen topic'.

After the removal of the aforementioned items, the PCA with a forced five-component solution showed an increased value both in KMO (0.881) and the total variance explained (65.34%). Nevertheless, in one of the suggested components only three items were

loaded with low loadings (between 0.630 and 0.740). What is more, the scree plot indicated a four-factor solution.

The PCA with a forced four-component solution showed an important decrease in the total variance explained (59.91%). However, there were several items with low value in communality (<0.500) and/or low factor loadings.

Therefore, in the subsequent analyses the following three items with communalities lower than 0.500 were gradually removed: 'Attending face-to-face or online learning events (e.g. conferences/seminars/courses) to learn about the topic', 'Posting questions about the topic on websites/social media', 'Asking more knowledgeable others (e.g. academics, mentors/professional people) about the topic'.

After the removal of the aforementioned items, PCA with a forced four-component solution showed an adequate structure (KMO=0.884 and a significant Bartlett test, $p < 0.000$) explaining 64.49% of the total variance. The rotated factor solution (Oblimin with Kaiser normalization) provided factor loadings ranging from 0.539 to 0.816, from 0.653 to 0.873, from 0.645 to 0.890, and from 0.613 to 0.833. The instruments showed nearly excellent to excellent reliability with a Cronbach's α of 0.880, 0.898, 0.888, and 0.919 respectively.

The first component contained seven items: 'Browsing literature related to your field and/or your interests', 'Browsing websites related to your field and/or your interests', 'Conducting an organized search to find key literature related to the topic', 'Evaluating literature found for quality and relevance with the topic', 'Reading literature to increase your knowledge on the topic', 'Recording and organizing the information related to the topic', 'Writing the theoretical part of the TFM'. This component can be called '*Developing theoretical understanding*'.

The second component contained eight items: 'Considering the ethical issues', 'Selecting the research methodology or the methodology of the professional intervention', 'Designing and/or selecting the data collection methods and instruments', 'Utilizing the data analysis methods', 'Planning the fieldwork (e.g. scheduling interviews, conducting a pilot or an intervention, selecting participants)', 'Collecting data of the research or of the professional intervention', 'Analysing collected data', 'Presenting the results of the TFM in different ways (e.g. tables, graphs)'. This component can be called '*Designing and implementing*'.

The third component contained six items: 'Interpreting and discussing the results', 'Evaluating the extent to which the TFM has achieved its initial purpose', 'Reflecting on the adequacy of the design of the research methodology or professional intervention methodology', 'Reflecting on the implementation of the research project or professional intervention project', 'Reflecting on the relevance of the results of the research project or professional intervention project', 'Reflecting on the process of presenting the TFM to the board'. This component can be called '*Evaluating and reflecting*'.

The fourth component contained nine items: 'Evaluating the results and reaching conclusions', 'Structuring the TFM according to the guidelines', 'Writing all the required parts of the TFM', 'Using a citation style throughout the TFM and verifying that the reference list is correct', 'Self-evaluating the TFM before submission (e.g. revising and proofreading)', 'Developing a specific document (e.g. a PowerPoint) to present the TFM', 'Rehearsing and revising the presentation', 'Presenting and recording the presentation of the TFM', 'Answering board's questions about the presentation'. This component can be called '*Writing and presenting*'.

7.5.9. Experienced Emotions

Student-teachers were asked to report on the emotions they experienced while carrying out the TFM based on an instrument of 21 items.

The initial PCA showed a complex solution of four components explaining 63.07% of the total variance. However, in one of the suggested components only three items were loaded with low loadings (between 0.450 and 0.600). What is more, the scree plot indicated a three-factor solution.

The PCA with a forced three-component solution showed a meritorious KMO value (0.896), but a low total variance explained (57.87%). The suggested solution is not so clear as there are two or three items that load in two components. On a further exploration of this solution, one of the factors remained with only two items. Therefore, it was preferred to conduct a PCA with a forced two-component solution.

The PCA with a forced two-component solution showed a clear structure and a meritorious KMO value (0.896), but a quite low total variance explained (52.25%). Two items ('Boredom' and 'Relief') had low values in communality (<0.260) and low loadings (<0.510), therefore they were removed.

After the removal of the two items, the PCA with a forced two-component solution showed a slightly increased KMO value (0.898) and an increased value in total variance explained (55.67%). The component matrix shows that one of the items ('Shame') is correlated to both factors. Additionally, this item has low value in communality (0.355), therefore it was removed.

After the removal of the item, the PCA showed a two-component solution with a marvelous KMO value (0.903), yet a bit low value in the total variance explained (57.13%).

There are some items with communality value below 0.5. The Cronbach's alpha of each component was checked.

Both components showed high values in Cronbach's alpha (>0.890), therefore it was decided to continue removing items with low value in communality and low loadings in order to increase the total variance explained value. Step-by-step the following four items were removed: 'Disappointment', 'Hope', 'Anxiety', 'Belonging', 'Exhaustion'.

After the removal of the aforementioned items, PCA showed an adequate two-component structure ($KMO=0.900$ and a significant Bartlett test, $p<0.000$), explaining 63.48% of the total variance. The rotated factor solution (Oblimin with Kaiser normalization) provided factor loadings ranging from 0.725 to 0.839 and from 0.741 to 0.864. The first instrument contained seven and the second six items; both instruments showed good reliability, with a Cronbach's α of 0.902 and 0.876 respectively.

The items that comprise the first component are: 'Enjoyment', 'Enthusiasm', 'Pride', 'Admiration', 'Pleasure', 'Satisfaction', 'Gratitude'. This component can be called '*Positive emotions*'.

The items that comprise the second component are: 'Anger', 'Distrust', 'Sadness', 'Loneliness', 'Frustration', 'Fear'. This component can be called '*Negative emotions*'.

7.5.10. Knowledge Acquired

Student-teachers were asked to report on their perceptions regarding the knowledge they acquired while carrying out the TFM based on an instrument of 18 items.

The initial PCA showed an adequate three-component structure ($KMO=0.904$ and a significant Bartlett test, $p<0.000$) explaining 71.32% of the total variance. The scree plot supported the three-component structure too. Nevertheless, the structure and pattern matrix

reveal that some items load in more than one component. Moreover, the communalities matrix shows that these items do not contribute much (<0.600). Therefore, it was decided to gradually remove these problematic items.

The following items were gradually removed: [I increased my knowledge on] 'information about the social context of the research or the professional intervention', 'myself, who I am and I act as a student', 'problems existing in social reality (e.g., in an educational institution, in a professional collective, etc.)', 'how to reach to conclusions based on the results', 'how to present and discuss the results', 'how to design a research or a professional intervention'.

After the removal of the aforementioned items, the PCA showed an adequate three-component structure ($KMO=0.881$ and a significant Bartlett test, $p<0.000$) explaining 78.96% of the total variance. The rotated factor solution (Oblimin with Kaiser normalization) provided factor loadings ranging from 0.879 to 0.949, from 0.867 to 0.903, and from 0.825 to 0.876. Each instrument contained four items and all instruments showed good to excellent reliability, with a Cronbach's α of 0.939, 0.907, and 0.865 respectively.

The items that comprise the first component are: [I increased my knowledge on] 'how to search for possible solutions in a real problem', 'how to design solutions to a real problem', 'how to implement solutions to a real problem', 'how to reflect on the implemented solution of a real problem'. This component can be called '*Developing theoretical knowledge about conducting inquiry*'.

The items that comprise the second component are: [I increased my knowledge on] 'how to collect and analyse data', 'procedural aspects related to the research processes', 'procedural aspects related to the professional intervention', 'how to make decisions about

how to do a research or professional intervention'. This component can be called '*Developing practical knowledge about conducting inquiry*'.

The items that comprise the third component are: [I increased my knowledge on] 'how to read academic papers', 'how to write the theoretical part of the TFM', 'how to write an academic text (e.g. an article or a report)', 'conceptual (theoretical) aspects related to the topic of the TFM'. This component can be called '*Developing knowledge on academic reading and writing*'.

7.5.11. Support from People

Student-teachers were asked to report on their perceptions regarding the support they received from other people while carrying out the TFM based on an instrument of 11 items.

The initial PCA showed an adequate three-component structure (KMO=0.797 and a significant Bartlett test, $p<0.000$) explaining 74.12% of the total variance. There were some correlations among the components, therefore the oblimin rotation was preferred. One of the items ('My classmates have given me enough social and emotional support') had low value in communality (<0.500) and, what is more important, did not fit well in terms of content with the rest of the items in the component, therefore, it was removed.

After the removal of the item, the PCA showed an adequate three-component structure (KMO=0.787 and a significant Bartlett test, $p<0.000$) explaining 78.71% of the total variance. The rotated factor solution (Oblimin with Kaiser normalization) provided factor loadings ranging from 0.911 to 0.945, from 0.925 to 0.936, and from 0.713 to 0.920. The first instrument contained three items, the second two items, and the third five items. The instruments showed good to excellent reliability with Cronbach's α of 0.922, 0.848, and 0.892 respectively.

The items that comprise the first component are: 'The UOC professor has given me enough feedback on my progress throughout the TFM', 'The UOC professor has given me enough emotional support', 'The UOC professor has given me enough learning orientations to guide the work of the TFM'. This component can be called '*Support from the supervisor*'.

The items that comprise the second component are: 'The UOC has given me access to enough content material of my TFM', 'The UOC people have provided me with access to useful technology to develop the TFM'. This component can be called '*Support from the university*'.

The items that comprise the third component are: 'The people affected by the practical part of my TFM have participated with sufficient motivation', 'The affected people have collaborated with me in the design of the research or professional intervention', 'The affected people have helped me to implement the research or the professional intervention', 'The affected people have provided me with most of the information that I have needed in the practical part of my TFM', 'The affected people have helped me solve the problems that have appeared in the practical part of my TFM'. This component can be called '*Participants' engagement with the inquiry*'.

7.6. Findings

7.6.1. What are Student-Teachers' Perceptions Regarding Their Skills, the Extent to Which They Have Practiced Inquiry Skills and Increased Knowledge During Their Thesis, and the Extent to Which Other People Participated in the Development of Their Thesis?

The first research question is broken down to four sub-questions. The first sub-question is related to student-teachers' perceptions regarding the information literacy, research, and professional skills they have. The second sub-question is related to student-

teachers' perceptions regarding the inquiry skills that they practiced during their thesis. The third sub-question is related to student-teachers' perceptions regarding the knowledge they have gained during their thesis. Lastly, the fourth sub-question is related to student-teachers' perceptions regarding the involvement (either because they have helped or because they have been affected) of other people into their thesis.

What are the Information Literacy, Research, and Professional Skills That Student-Teachers Perceive They Have?

Overall, student-teachers reported that they have quite high information literacy, research, and professional skills, yet there was a quite high variation in their responses (see Table 25).

As regards information literacy skills, on average student-teachers reported to have a moderate to high level. The highest average value was observed in the skill of sharing information in which the typical student-teacher has high skills (mean: 4.08), while the lowest value in the skill of managing information in which the typical student-teacher has moderate to high skills (mean: 3.56). However, there was quite high dispersion in the responses with Standard Deviation (SD) average values at nearly 0.85.

It is unsurprising that student-teachers reported quite high information literacy skills since they are attending a postgraduate course delivered fully online. Studying online requires at least a basic level of information literacy and it can be safely assumed that by studying online student-teachers have developed their information literacy skills as well. Therefore, it comes to no surprise that student-teachers studying online have a much higher information literacy skills than the OECD average (OECD, 2019).

As regards research skills, on average student-teachers reported to have a moderate to high level. The highest average value was observed in the skill of building knowledge about a

topic in which the typical student-teacher has nearly high skills (mean: 3.76), while the lowest value in the skill of analysing data in which the typical student-teacher has moderate skills (mean: 3.13). However, there was quite high dispersion in the responses with SD average values at nearly 0.80.

As regards professional skills, on average student-teachers reported to have a moderate to high level. The highest average value was observed in the skill of developing professional knowledge and understanding of a problem of practice in which the typical student-teacher has nearly high skills (mean: 3.88), while the lowest value in the skill of evaluating the practical intervention and reflecting on the outcomes in which the typical student-teacher has moderate to high skills (mean: 3.66). However, there was quite high dispersion in the responses with SD average values at nearly 0.75.

The aforementioned findings can be considered expected since student-teachers were attending a postgraduate course aiming to develop their research and professional skills. What is more, bearing in mind that at the time they answered to the questionnaire they had already submitted their thesis, it is reasonable to assume that they had both increased their research and professional skills as well as their confidence in them.

Table 25: Means and standard deviations of student-teachers' information literacy, research, and professional skills (1: very low; 2: low, 3: moderate, 4: high, 5: very high).

Skills	Mean	SD	
Information literacy skills	Using specific computer programmes	3.90	0.82
	Accessing and evaluating the information on the web	3.82	0.72
	Managing information	3.56	0.89
	Transforming information	3.71	0.89
	Presenting information	3.97	0.81
	Sharing information	4.08	0.81

	Using information safely and securely	3.69	0.93
		3.81	0.84
	Finding a topic	3.49	0.79
	Building your knowledge about a topic	3.76	0.69
Research skills	Planning a research project	3.50	0.76
	Collecting data	3.61	0.74
	Analysing data	3.13	0.94
	Writing an academic article	3.34	0.83
		3.47	0.79
	Knowing the professional context as well as its tasks and problems	3.70	0.69
	Finding information to focus on a problem related to a professional context	3.75	0.70
Professional skills	Developing your professional knowledge and understanding of a problem of practice	3.88	0.68
	Designing and implementing a practical intervention to address a problem	3.71	0.80
	Evaluating the practical intervention and reflecting on the outcomes	3.66	0.83
		3.74	0.74

To What Extent Student-Teachers Perceive That They Have Practiced Their Inquiry Skills During Their Thesis?

Overall, student-teachers reported that they practiced several inquiry skills and at quite high extent during their thesis (see Table 26). Therefore, once more it is confirmed that these skills are relevant to teacher inquiry and, subsequently, it is confirmed that the theoretical model proposed in this thesis is sound and logical. However, once more the model is not entirely confirmed since the empirical analysis (see section 8.5.), revealed a differed

way of how inquiry skills are practiced by student-teachers when conducting a thesis. The results are presented in more detail regarding each inquiry skill in the paragraphs that follow.

Student-teachers reported that they practice searching and focusing skills to a quite high extent (means 4.16 and 4.07 respectively). Little variation was observed in the means of the different searching and focusing skills (lowest: 3.94; highest: 4.32) and the average SDs values (0.670 and 0.694 respectively) were moderate.

When it comes to understanding and exploring skills, student-teachers reported that they practiced the former to a quite high extent (mean: 4.17), whereas the latter to a moderate extent (mean: 2.99). As regards understanding skills, the variation in the means of the different skills was minimal (lowest: 4.01; highest: 4.28) and the means of the SDs were moderate (approximately 0.68) and without much variation. On the other hand, important variation was observed in the exploring skills (lowest: 2.55; highest: 3.49). More specifically, it appears that asking more knowledgeable others and discussing with colleagues about the topic (means: 3.49 and 3.28 respectively) were the primary means for practicing their inquiry skills, whereas attending learning events and posting questions on the web (means 2.65 and 2.55 respectively) were the least practiced ways. In addition, the highest average SD value (1.13) compared to the other inquiry skills was observed, which signifies that there was a relatively high variation in student-teachers' responses.

Student-teachers reported that they practice designing and implementing skills to a quite high extent (means 4.00 and 3.97 respectively). High variation was observed in the average values of the different designing skills, which means that the typical student-teacher practiced some skills more than others. The highest mean value (4.29), as well as the lowest SD (0.59), was observed in the skill titled 'writing the theoretical part of the TFM', whereas the lowest mean value (3.67) and highest SD (1.03) in the skill titled 'utilizing the data

analysis methods'. Overall, quite high values were observed in SDs (mean: 0.84). As regards implementing skills, the variation in the means of the different skills was minimal (lowest: 3.89; highest: 4.03), yet the means of the SDs were quite high (0.96).

Student-teachers reported that they practice interpreting and evaluating as well as reflecting skills to a quite high extent (means 4.17 and 3.97 respectively). As regards interpreting and evaluating skills, minimal variation was observed in the means of the different skills (lowest: 4.11; highest: 4.23) and the average SD (0.70) was moderate. Similarly, little variation was observed in the means of the different reflecting skills (lowest: 3.88; highest: 4.02), while the average SD (0.82) was high.

The highest average values were observed in the skills of writing and presenting (4.22 and 4.32 respectively). In general, little variation was observed in the means of the different writing and focusing skills which had values around 4.30 with the exception of the writing skill titled 'sending the TFM document before submission to others and asking for feedback', which had an average value of 3.43 and the highest value in SD (1.20). The average SDs values (0.76 and 0.79 respectively) were high.

What stands out from the descriptive analysis of the inquiry skills is the quite lower practicing of exploring skills by student-teachers. As aforementioned, student-teachers reported that they practice inquiry skills to a moderate extent on average, but when it comes to exploring skills, they reported that they practice these skills to some extent. It is not possible to infer why there is such disparity among exploring and the rest of the inquiry skills and a future qualitative research on this issue might shed some light.

Table 26: Means and standard deviations of the extent to which student-teachers practiced their inquiry skills during their thesis (1: not at all; 2: to a small extent; 3: to some extent; 4: to a moderate extent; 5: to a great extent).

Inquiry Skills	Mean	SD
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	Listing relevant topics and interests to your profession or listing topics that you would like to research	4.00	0.68
Searching	Asking the opinion of others about your initial ideas	4.03	0.83
	Browsing literature related to your field and/or your interests	4.30	0.57
	Browsing websites related to your field and/or your interests	4.32	0.60
		4.16	0.67
	Reducing the list of topics to a choice of 2-3 topics	4.00	0.83
Focusing	Identifying the purpose of your TFM	4.23	0.61
	Formulating research questions or professional intervention questions about the chosen topic	4.11	0.59
	Evaluating the viability of the TFM on the chosen topic	3.94	0.74
		4.07	0.69
	Conducting an organized search to find key literature related to the topic	4.19	0.71
Understanding	Evaluating literature found for quality and relevance with the topic	4.01	0.76
	Reading literature to increase your knowledge on the topic	4.28	0.62
	Recording and organizing the information related to the topic	4.18	0.64
		4.17	0.68
	Discussing with your colleagues about the topic	3.28	1.14
Exploring	Posting questions about the topic on websites/social media	2.55	1.07
	Asking more knowledgeable others about the topic	3.49	1.13
	Attending learning events to learn about the topic	2.65	1.18
		2.99	1.13
	Specifying in an operational way the aims of the professional intervention	3.82	0.87
Designing	Considering the ethical issues	4.18	0.87
	Selecting the research methodology or the methodology of the professional intervention	4.05	0.80
	Designing and/or selecting the data collection methods	3.99	0.84
	Utilizing the data analysis methods	3.67	1.03

	Writing the theoretical part of the TFM	4.29	0.59
		4.00	0.84
Implementing	Planning the fieldwork	3.89	1.03
	Collecting data	4.01	0.93
	Analysing collected data	4.03	0.86
	Presenting the results of the TFM in different ways	3.96	1.00
		3.97	0.96
Interpreting and evaluating	Interpreting and discussing the results	4.11	0.76
	Evaluating the results and reaching conclusions	4.23	0.66
	Evaluating the extent to which the TFM has achieved its initial purpose	4.18	0.67
		4.17	0.70
Reflecting	Reflecting on the adequacy of the design of the research methodology or professional intervention methodology	4.02	0.78
	Reflecting on the implementation of the research project or professional intervention project	3.88	0.89
	Reflecting on the relevance of the results of the research project or professional intervention project	4.02	0.80
		3.97	0.82
Writing	Structuring the TFM according to the guidelines	4.41	0.62
	Writing all the required parts of the TFM	4.54	0.57
	Using a citation style throughout the TFM and verifying that the reference list is correct	4.37	0.70
	Sending the TFM document before submission to others and asking for feedback	3.43	1.20
	Self-evaluating the TFM before submission	4.34	0.69
		4.22	0.76
Presenting	Developing a specific document to present the TFM	4.43	0.70
	Rehearsing and revising the presentation	4.28	0.82
	Presenting and recording the presentation of the TFM	4.38	0.77

Answering board's questions about the presentation	4.40	0.71
Reflecting on the process of presenting the TFM to the board	4.13	0.95
	4.32	0.79

To What Extent Student-Teachers Perceive That They Have Increased Their Knowledge During Their Thesis?

Overall, student-teachers perceived that they increased their knowledge on all three dimensions investigated (see Table 27).

More specifically, student-teachers agreed that they increased their knowledge in all aspects of the personal learning dimension, acquired different types of knowledge, and learned about developing inquiring-related processes (means 4.02, 4.00, and 3.98 respectively). Overall, little variation was observed in the means among the different knowledge aspects investigated through the survey, with the lowest value at 3.90 and the highest at 4.19. The average SD values were quite high, at about 0.80, which demonstrates that the responses were quite dispersed.

All in all, it comes out that practicing of inquiry skills was accompanied by knowledge increase on issues related to how to conduct inquiry ranging from understanding problems existing in social reality to how to write an academic text and even a better understanding of themselves as students. As a result, it could be argued that student-teachers acquired both the knowledge and skills to conduct inquiry beyond their postgraduate studies. In other words, while conducting their thesis student-teachers have developed their teacher as inquirer identity.

Table 27: Means and standard deviations of the extent to which student-teachers increased their knowledge on different dimensions (1: strongly disagree; 2: disagree, 3: neutral, 4: agree, 5: strongly agree).

Knowledge dimensions	Mean	SD	
Personal learning dimension	how to read academic papers	3.90	0.83
	how to write the theoretical part of the TFM	4.18	0.76
	how to design a research or a professional intervention	4.06	0.79
	how to collect and analyse data	3.90	0.92
	how to present and discuss the results	4.04	0.83
	how to reach to conclusions based on the results	4.03	0.78
	how to write an academic text (e.g. an article or a report)	4.06	0.85
	4.02	0.82	
Different types of knowledge	conceptual (theoretical) aspects related to the topic of the TFM	4.19	0.69
	procedural aspects related to the research processes	3.95	0.85
	procedural aspects related to the professional intervention	3.90	0.84
	information about the social context of the research or the professional intervention	4.04	0.72
	how to make decisions about how to do a research or professional intervention	3.95	0.80
	myself, who I am and I act as a student	3.95	0.85
	4.00	0.79	
Learn about developing inquiring-related processes	problems existing in social reality	4.03	0.84
	how to search for possible solutions in a real problem	4.07	0.75
	how to design solutions to a real problem	3.97	0.83
	how to implement solutions to a real problem	3.90	0.87
	how to reflect on the implemented solution of a real problem	3.94	0.87
	3.98	0.83	

To What Extent Student-Teachers Perceive That Other People Participated in the Development of Their Thesis?

Overall, student-teachers perceived that the supervisor and other people from the university have helped them during the thesis and that affected people from the thesis were supportive (see Table 28).

More specifically, on average student-teachers agreed that the supervisor and other people from the university helped them in their thesis (means 4.02 and 4.00 respectively). Overall, minimal variation was observed in the means among the different statements regarding support received, with the lowest value at 3.90 and the highest at 4.19. The average SD values were quite high though, at about 0.80.

As regards the people who were affected by the thesis, student-teachers agreed that they were engaged with the research. Overall, minimal variation was observed in the means among the different statements regarding people's engagement with the research, with the lowest value at 3.90 and the highest at 4.07. The average SD values were quite high though, at about 0.83.

In short, it could be argued that student-teachers recognized the contribution of the social environment in the development of their thesis and, more broadly, in the development of their identity as teacher-inquirer.

Table 28: Means and standard deviations of the extent to which student-teachers perceived that other people helped them (1: strongly disagree; 2: disagree, 3: neutral, 4: agree, 5: strongly agree).

Involved people		Mean	SD
Supervisor	The UOC professor has given me enough feedback on my progress throughout the TFM	3.90	0.83
	The UOC professor has given me enough emotional support	4.18	0.76

People from the university	The UOC professor has given me enough learning orientations to guide the work of the TFM	4.06	0.79
		4.02	0.82
	My classmates have given me enough social and emotional support	4.19	0.69
	The UOC has given me access to enough content material of my TFM	3.95	0.85
	The UOC people have provided me with access to useful technology to develop the TFM	3.90	0.84
		4.00	0.79
People taking part in the inquiry	The people affected by the practical part of my TFM have participated with sufficient motivation	4.03	0.84
	The affected people have collaborated with me in the design of the research or professional intervention	4.07	0.75
	The affected people have helped me to implement the research or the professional intervention	3.97	0.83
	The affected people have provided me with most of the information that I have needed in the practical part of my TFM	3.90	0.87
	The affected people have helped me solve the problems that have appeared in the practical part of my TFM	3.94	0.87
		3.98	0.83

7.6.2. To What Degree Practicing of Inquiring Skills During the Thesis is Related to Previous Experience in Conducting a Thesis, Other Relevant Skills, Emotions, Perceptions of Ownership, Sense-Making, and Agency, Knowledge Increase, and Involvement of Other People?

The second research question is broken down to five sub-questions all related to the practice of inquiry skills during the thesis. The first sub-question is concerned with the relation between information literacy skills, research skills, professional skills, English language skills, experience in conducting thesis, and inquiry skills. The second sub-question is concerned with the relation between perceptions of ownership, sense-making, agency, and

participants' engagement and inquiry skills. The third sub-question is concerned with the relation between emotions and inquiry skills. The fourth sub-question is concerned with the relation between perceptions regarding support received from the university and the supervisor and inquiry skills. The last sub-question is concerned with the relation between perceptions regarding increased knowledge and the inquiry skills.

To What Extent Information Literacy, Research, Professional, English Language Skills and Experience in Conducting Thesis are Related to the Inquiry Skills That Student-Teachers Practice During Their Thesis?

Table 29 shows the descriptive results (mean and standard deviations) and the correlation between the variables of information literacy skills, research skills, professional skills, English language skills, experience in conducting thesis, and inquiry skills. Table 30 shows the squared correlation coefficient of the relationships.

Table 29: Means, standard deviations, and correlations between the variables of information literacy skills, research skills, professional skills, English language skills, experience in conducting thesis, and inquiry skills (n=154).

Variable		Information literacy skills	Research skills	Professional skills	English skills	Experience in conducting thesis
	M (SD)	3.85 (0.65)	3.41 (0.66)	3.74 (0.60)	3.36 (0.88)	3.51 (1.23)
Developing theoretical understanding	4.23 (0.49)	0.53 ^b	0.47 ^b	0.52 ^b	0.08	0.14
Designing and implementing	3.97 (0.70)	0.12	0.35 ^b	0.28 ^b	-0.09	0.00
Evaluating and reflecting	4.06 (0.65)	0.25 ^a	0.38 ^b	0.40 ^b	0.02	0.12
Writing and presenting	4.38 (0.54)	0.31 ^b	0.25 ^a	0.29 ^b	-0.02	0.08

^a p<0.006. Bonferroni correction 0.05/9 = 0.006

^b $p < 0.001$. Bonferroni correction $0.01/9 = 0.001$

Table 30: Squared correlation coefficients between the variables of information literacy skills, research skills, professional skills, English language skills, experience in conducting thesis, and inquiry skills.

Variable	Information literacy skills	Research skills	Professional skills	English skills	Experience in conducting thesis
Developing theoretical understanding	28.1 ^b	22.1 ^b	27.0 ^b	0.6	2.0
Designing and implementing	1.4	12.3 ^b	7.8 ^b	0.8	0.0
Evaluating and reflecting	6.3 ^a	14.4 ^b	16.0 ^b	0.0	1.4
Writing and presenting	9.6 ^b	6.3 ^a	8.4 ^b	0.0	0.6

^a $p < 0.006$. Bonferroni correction $0.05/9 = 0.006$

^b $p < 0.001$. Bonferroni correction $0.01/9 = 0.001$

The results show that there is a positive correlation between information literacy skills, research skills, and professional skills and inquiry skills, while no correlation emerged between English skills and experience in conducting thesis and inquiry skills. From the 12 relationships between the variables that were correlated, 11 are marked statistically significant (92%) and in half of the relationships more than 10% of the variation is shared among the involved variables. On average, the shared variation among these variables and inquiry skills is at 13.3%. The results are presented in more detail regarding each of the four inquiry skills in the paragraphs that follow.

The developing theoretical understanding skill demonstrates the strongest relationships with information literacy, research, and professional skills compared to the

other inquiry skills. The shared variation in the relationships is over 22% and the average shared variation is at 25.7%.

The designing and implementing skill is positively correlated only with research and professional skills. The average shared variation in these two relationships is at 10.1%.

The evaluating and reflecting skill is positively correlated to information literacy, research, and professional skills, yet to a different degree. The relationship with information literacy skills is rather weak as the shared variation is only 6.3%, while, on the other hand, the relationships with research and professional skills is close to 15%. Overall, the average shared variation is at 12.2%.

The writing and presenting skill is positively correlated to information literacy, research, and professional skills, yet the relationships are quite weak. Overall, the average shared variation is at 8.1%.

These results could mean that information literacy skills are very important when student-teachers are developing theoretical understanding since they have to search for resources, evaluate information, and manage information. Similarly, information literacy skills are important when student-teachers are using their writing and presenting skills since they have to transform and present information. Lastly, information literacy skills are of very low importance when student-teachers are evaluating and reflecting and of no importance when they are designing and implementing, since these inquiry skills do not usually require use of technology.

When it comes to research skills, it could be argued that the results are expected since inquiry skills are very closely related to research skills.

Similarly, taking into account that professional skills are related to building knowledge regarding the professional context and finding information regarding professional problems, the strong relationship with developing theoretical understanding makes sense. As regards evaluating and reflecting as well as designing and implementing these are closely related to similar professional skills and, thus, the relationship is reasonable. One could question why only a weak relationship with designing and implementing emerged, since these skills are included in both inquiry and professional skills. Perhaps the answer lies in that not all student-teachers conducted a practical intervention in their professional context. Lastly, although writing and presenting skills are not included in the professional skills, a connection, even weak, emerged. This might mean that student-teachers perceive that presenting and writing skills are important professional skills as well.

As regards English language skills it should be taken into account that most student-teachers reported an advanced English language level, which may explain this outcome. On the other hand, perhaps student-teachers only minimally employ their English language skills during inquiry and instead they depend on their native language.

As regards the no relationship between experience in conducting thesis and inquiry skills, it is an unexpected outcome since normally with experience comes development of skills. Perhaps previous experiences in conducting a thesis did not actually help students to develop their inquiry skills or perhaps there is a significant time gap between their previous and current experience which deteriorated their inquiry skills.

To What Extent Perceptions of Ownership, Sense-Making, Agency, and Participants' Engagement are Related to the Inquiry Skills That Student-Teachers Practice During Their Thesis?

Table 31 shows the descriptive results (mean and standard deviations) and the correlation between the variables of ownership, sense-making, agency, participants' engagement with the inquiry, and inquiry skills. Table 32 shows the squared correlation coefficient of the relationships.

Table 31: Means, standard deviations, and correlations between the variables of ownership, sense-making, agency, participants' engagement, and inquiry skills (n=154).

Variable		Ownership	Sense-making	Agency (negotiation of student identity)	Agency (influence on one's work)	Participants' engagement with the inquiry
	M (SD)	4.46 (0.57)	4.04 (0.77)	3.79 (0.73)	4.09 (0.72)	3.53 (0.95)
Developing theoretical understanding	4.23 (0.49)	0.38 ^b	0.25 ^a	0.18	0.18	0.16
Designing and implementing	3.97 (0.70)	0.27 ^a	0.17	0.14	0.13	0.22 ^a
Evaluating and reflecting	4.06 (0.65)	0.38 ^b	0.34 ^b	0.29 ^b	0.32 ^b	0.24 ^a
Writing and presenting	4.38 (0.54)	0.51 ^b	0.28 ^b	0.27 ^a	0.27 ^a	0.05

^a $p < 0.006$. Bonferroni correction $0.05/9 = 0.006$

^b $p < 0.001$. Bonferroni correction $0.01/9 = 0.001$

Table 32: Squared correlation coefficients between the variables of ownership, sense-making, agency, participants' engagement, and inquiry skills.

Variable	Ownership	Sense-making	Agency (negotiation of student identity)	Agency (influence on one's work)	Participants' engagement with the inquiry

Developing theoretical understanding	14.4 ^b	6.3 ^a	3.2	3.2	2.6
Designing and implementing	7.3 ^a	2.9	2.0	1.7	4.8 ^a
Evaluating and reflecting	14.4 ^b	11.6 ^b	8.4 ^b	10.2 ^b	5.8 ^a
Writing and presenting	26.0 ^b	7.8 ^b	7.3 ^a	7.3 ^a	0.3

^a $p < 0.006$. Bonferroni correction $0.05/9 = 0.006$

^b $p < 0.001$. Bonferroni correction $0.01/9 = 0.001$

The results show that there is a positive correlation between the aforementioned variables and the variables related to inquiry skills. From the 20 relationships between these variables, 13 are marked statistically significant (65%) and the average shared variation among the variables in these relationships is 10%. The correlations with ownership demonstrate the highest shared variation in all cases. The results are presented in more detail regarding each of the four inquiry skills in the paragraphs that follow.

The developing theoretical understanding skill is positively correlated only with ownership and sense-making. The percentage of shared variation with ownership is at 14.4%, while with sense-making is at 6.3%.

The designing and implementing skill is positively correlated only with ownership and participants' engagement with the inquiry. The average shared variation in these two relationships is at 6%.

The evaluating and reflecting skill is positively correlated to all five variables. The highest shared variation is observed with ownership at 14.4%, while the lowest with

participants' engagement with the inquiry at 5.8%. Overall, the average shared variation is at 10%.

The writing and presenting skill is positively correlated to ownership, sense-making, and agency, yet to a different degree. The relationship with ownership is by far the strongest one as the shared variation is at 26.0%, while, on the other hand, the relationships with sense-making and agency have a shared variation at approximately 7.5%.

Overall, perceptions of ownership were found to be related to all inquiry skills. In particular, perceptions of ownership have a stronger relationship with writing and presenting skills, less with developing theoretical understanding as well as with evaluating and reflecting skills, and even less with designing and implementing skills. Ketelaar et al. found that ownership is related to the extent to which teachers are willing to communicate about an educational innovation (Ketelaar et al., 2012, 2014), which is in line with the strong relationship between ownership and writing and presenting skills. Similarly, it was found that ownership is related to the extent to which teachers are willing to engage with an educational innovation (Berrill & Whalen, 2007) or with inquiry-based working (Baan et al., 2020), which is corroborated by the increased practice of inquiry skills, since the more the teachers engaged with the educational innovation and sensed ownership, the more they practiced their inquiry skills.

As regards sense-making it is difficult to interpret the results, especially with reference to the no connection between sense-making and designing and implementing. This might imply that student-teachers were in a state of toleration or distantiation (Luttenberg et al., 2013) while designing and implementing their inquiry. If this is the case, then it is peculiar that they were feeling that the inquiry makes sense when they were employing their evaluating and reflecting skills. Another possible explanation is that not all student-teachers

designed and implemented an intervention and as such they could not relate well to their own experience when answering questions about designing and implementing skills.

The low to non-existent relations of agency with inquiring skills indicate that student-teachers did not manage to exercise agency to a sufficient extent during their thesis. While this outcome could be considered expected to some extent as regards the developing theoretical understanding skill, since student-teachers cannot exercise much agency when, for instance, read, organize, and evaluate the literature, yet when it comes to designing and implementing skills, the no connection with agency indicates that student-teachers felt that they did not have control over crucial parts of their thesis. On the other hand, while reflecting and evaluating the outcomes of their thesis student-teachers felt that they exercised agency to some extent. This may indicate the importance of reflecting and evaluating skills for exercising agency.

Bearing in mind that participants' role in an inquiry is crucial during designing and implementing, one would expect a stronger connection between participants' engagement with the inquiry and designing and implementing skills. Perhaps this outcome indicates that student-teachers perceived that participants' role was not that important during designing and implementing. It was interesting to see that participants' engagement with the inquiry was also related to evaluating and reflecting skills. It does not seem plausible that participants in the inquiry helped in some way while student-teachers were utilizing their evaluating and reflecting skills, yet this outcome may indicate that student-teachers appreciated the role of participants while they were reflecting and evaluating the inquiry.

To What Extent are Emotions Related to the Inquiry Skills That Student-Teachers Practice During Their Thesis?

Table 33 shows the descriptive results (mean and standard deviations) and the correlation between the variables of emotions and inquiry skills. Table 34 shows the squared correlation coefficient of the relationships.

Table 33: Means, standard deviations, and correlations between the variables of emotions and inquiry skills (n=154).

Variable		Positive emotions	Negative emotions
	M (SD)	3.46 (0.77)	2.14 (0.96)
Developing theoretical understanding	4.23 (0.49)	0.41 ^b	-0.15
Designing and implementing	3.97 (0.70)	0.30 ^b	-0.15
Evaluating and reflecting	4.06 (0.65)	0.42 ^b	-0.21
Writing and presenting	4.38 (0.54)	0.34 ^b	-0.19

^a $p < 0.008$. Bonferroni correction $0.05/6 = 0.008$

^b $p < 0.001$. Bonferroni correction $0.01/6 = 0.001$

Table 34: Squared correlation coefficients between the variables of emotions and inquiry skills.

Variable	Positive emotions	Negative emotions
Developing theoretical understanding	16.8 ^b	2.3
Designing and implementing	9.0 ^b	2.3

Evaluating and reflecting	17.6 ^b	4.4
Writing and presenting	11.6 ^b	3.6

^a $p < 0.008$. Bonferroni correction $0.05/6 = 0.008$

^b $p < 0.001$. Bonferroni correction $0.01/6 = 0.001$

The results show that there is a positive, statistically significant correlation between positive feelings and inquiry skills and a negative, yet not statistically significant, correlation between negative feelings and inquiry skills. The average shared variation between positive feelings and inquiry skills is nearly 14%. The evaluating and reflecting skill and the developing theoretical understanding skill demonstrate the highest shared variation with positive feelings at approximately 17%, while the designing and implementing skill and the writing and presenting skill the lowest at approximately 10%.

Although there are no studies on the relationship between student-teachers' emotions and their inquiry skills while conducting a thesis, it has been shown that emotional experiences are influential in shaping teachers' engagement in, and implementation of, professional development opportunities (Gaines et al., 2019). Add to that, it has been shown that teachers' perceptions of their skills are positively related to enjoyment (Lohbeck et al., 2018). On the other hand, it has been also shown that negative emotions counteract engagement in professional development (Gaines et al., 2019) and teachers' perceptions of their skills (Lohbeck et al., 2018). Therefore, the results of this thesis complement the literature as regards the role of positive emotions in student-teachers' professional development and perceptions of their skills.

It is not easy to explain why some inquiry skills were found to be more strongly related to emotions to others, which imply that, for example, the practice of evaluating and

reflecting skills is more emotionally laden than the practice of designing and implementing skills. Add to that, the no existence of relation between negative emotions and inquiry skills is in sharp contrast to the literature, unless the majority of the student-teachers who responded to the questionnaire mainly experienced positive emotions.

To What Extent are Perceptions Regarding Support Received From the University and the Supervisor are Related to the Inquiry Skills That Student-Teachers Practice During Their Thesis?

Table 35 shows the descriptive results (mean and standard deviations) and the correlation between the variables of support and inquiry skills. Table 36 shows the squared correlation coefficient of the relationships.

Table 35: Means, standard deviations, and correlations between the variables of support and inquiry skills (n=154).

Variable	M (SD)	Support from the university	Support from the supervisor
Developing theoretical understanding	4.23 (0.49)	3.42 (1.05)	4.01 (1.03)
Designing and implementing	3.97 (0.70)	0.05	0.04
Evaluating and reflecting	4.06 (0.65)	0.14	0.14
Writing and presenting	4.38 (0.54)	-0.03	0.24 ^a

^a $p < 0.008$. Bonferroni correction $0.05/6 = 0.008$

^b $p < 0.001$. Bonferroni correction $0.01/6 = 0.001$

Table 36: Squared correlation coefficients between the variables of support and inquiry skills.

Variable	Support from the university	Support from the supervisor
Developing theoretical understanding	0.6	4.4
Designing and implementing	0.3	0.2
Evaluating and reflecting	2.0	2
Writing and presenting	1.0	5.8 ^a

^a $p < 0.008$. Bonferroni correction $0.05/6 = 0.008$

^b $p < 0.001$. Bonferroni correction $0.01/6 = 0.001$

The results show that there is no statistically significant correlation between support and inquiry skills, apart from the support received from the supervisor and the writing and presenting skill. The shared variation among these two variables is at 5.8%.

The non-existent to minimal relationship between support received and practice of inquiry skills may indicate that the support received was not particularly helpful in the development of student-teachers' inquiry skills. The only relationship that emerged, though very weak, was between writing and presenting skills and support from the supervisor. This is unexpected at least in two respects. One would expect that support from the supervisor would have an impact on all inquiry skills and that this impact would be high. The current outcome imply that the support received from the supervisor was not particularly helpful in the development of student-teachers' inquiry skills and had only a minimal impact in writing and presenting skills.

To What Extent are Perceptions Regarding Knowledge Increased Related to the Inquiry Skills That Student-Teachers Practice During Their Thesis?

Table 37 shows the descriptive results (mean and standard deviations) and the correlation between the variables of knowledge and inquiry skills. Table 38 shows the squared correlation coefficient of the relationships.

Table 37: Means, standard deviations, and correlations between the variables of knowledge and inquiry skills (n=154).

Variable	M (SD)	Developing theoretical knowledge	Developing practical knowledge	Developing reading and writing knowledge
Developing theoretical understanding	4.23 (0.49)	0.14	0.27 ^a	0.37 ^b
Designing and implementing	3.97 (0.70)	0.09	0.35 ^b	0.05
Evaluating and reflecting	4.06 (0.65)	0.21	0.36 ^b	0.29 ^b
Writing and presenting	4.38 (0.54)	0.11	0.21	0.26 ^a

^a $p < 0.006$. Bonferroni correction $0.05/7 = 0.007$

^b $p < 0.001$. Bonferroni correction $0.01/7 = 0.001$

Table 38: Squared correlation coefficients between the variables of knowledge and inquiry skills.

Variable	Developing theoretical knowledge	Developing practical knowledge	Developing reading and writing knowledge
Developing theoretical understanding	2	7.3 ^a	13.7 ^b

Designing and implementing	0.8	12.3 ^b	0.3
Evaluating and reflecting	4.4	13.0 ^b	8.4 ^b
Writing and presenting	1.2	4.4	6.8 ^a

^a $p < 0.006$. Bonferroni correction $0.05/7 = 0.007$

^b $p < 0.001$. Bonferroni correction $0.01/7 = 0.001$

The results show that there is a positive correlation between practical knowledge, reading and writing knowledge, and inquiry skills, while no correlation emerged between theoretical knowledge and inquiry skills. From the 8 total relationships between the variables that are correlated, 6 are marked statistically significant (75%) and the shared variation among the correlated variables is on average at 10%. The results are presented in more detail regarding each of the four inquiry skills in the paragraphs that follow.

The developing theoretical understanding skill is positively correlated to both practical knowledge and reading and writing knowledge. The percentage of shared variation with practical knowledge is at 7.3%, while with reading and writing knowledge is higher at 13.7%.

The designing and implementing skill is positively correlated only with practical knowledge and the shared variation is at 12.3%.

The evaluating and reflecting skill is positively correlated to both practical knowledge and reading and writing knowledge. The percentage of shared variation with practical knowledge is at 13.0%, while with reading and writing knowledge is lower at 8.4%.

The writing and presenting skill is positively correlated only with reading and writing knowledge and the shared variation is at 6.8%.

Overall, these findings are quite different from what one could have expected. Hence, the no relationship between development of theoretical knowledge about inquiry and development of inquiry skills indicates that development of theoretical knowledge about inquiry and development of inquiry skills rather than going hand-in-hand, they are developed independently and perhaps at different rates. This outcome is in absolute contrast to what was expected.

On the other hand, when it comes to the relationships between practical knowledge development about conducting inquiry and inquiry skills, the findings seem more reasonable. Yet, again, it is difficult to explain why the relationships were not stronger (the shared variance was merely 10% more or less). The fact that no connection was found with writing and presenting skill could be easily explained since the practical knowledge development component is not concerned with this skill. Instead this is part of the last component, discussed below.

The developing knowledge on academic reading and writing was found to be related to all inquiry skills except designing and implementing. Overall, this outcome makes sense, since designing and implementing is the only skill that is not directly related to reading and writing. The relationship with developing theoretical understanding is quite strong (with a shared variance over 13%), though one could expect stronger connection. What is more unexpected is the weak connection with reading and writing with a shared variance at less than 7%. This signifies that development knowledge on academic reading and writing and writing and presenting skills are only loosely related. Perhaps this outcome is largely affected by the different skills required in presenting. Lastly, the weak connection with evaluating and reflecting highlights the role of evaluating and reflecting in the development of knowledge on academic reading and writing.

7.6.3. To What Extent Knowledge Increase During the Thesis is Related to Previous Experience in Conducting a Thesis, Other Relevant Skills, Emotions, Perceptions of Ownership, Sense-Making, and Agency, and Involvement of Other People?

The third research question is broken down to four sub-questions all related to the knowledge increase in light of the development of the thesis. The first sub-question is concerned with the relation between information literacy skills, research skills, professional skills, English language skills, experience in conducting thesis, and knowledge increase. The second sub-question is concerned with the relation between perceptions of ownership, sense-making, agency, and participants' engagement and knowledge increase. The third sub-question is concerned with the relation between emotions and knowledge increase. The last sub-question is concerned with the relation between perceptions regarding support received from the university and the supervisor and knowledge increase.

To What Extent Information Literacy, Research, Professional, English Language Skills and Experience in Conducting Thesis are Related to Student-Teachers' Knowledge Increase During Their Thesis?

Table 39 shows the descriptive results (mean and standard deviations) and the correlation between the variables of information literacy skills, research skills, professional skills, English language skills, experience in conducting thesis, and knowledge increase.

Table 39: Means, standard deviations, and correlations between the variables of information literacy skills, research skills, professional skills, English language skills, experience in conducting thesis, and knowledge increase (n=154).

Variable	Information literacy skills	Research skills	Professional skills	English skills	Experience in conducting thesis
M	3.85	3.41	3.74	3.36	3.51
(SD)	(0.65)	(0.66)	(0.60)	(0.88)	(1.23)

Developing theoretical knowledge	3.97 (0.77)	0.02	0.11	0.13	-0.09	0.05
Developing practical knowledge	3.92 (0.76)	0.08	0.22	0.19	-0.16	-0.05
Developing reading and writing knowledge	4.08 (0.66)	0.14	0.13	0.14	-0.14	-0.08

^a $p < 0.006$. Bonferroni correction $0.05/8 = 0.006$

^b $p < 0.001$. Bonferroni correction $0.01/8 = 0.001$

The results show that there is no correlation between these variables and student-teachers' knowledge increase during the thesis.

Surely, this outcome is unexpected, or at least a bit odd, from a cognitive learning theory perspective as it questions the contribution of previous knowledge and skills in the learning process. Undoubtedly, not all types of pre-existing knowledge and skills facilitate the acquisition of new knowledge, yet, it is reasonable to claim that, for instance, information literacy skills are sufficiently related and support knowledge development during a thesis.

To What Extent Perceptions of Ownership, Sense-Making, Agency, and Participants' Engagement are Related to Student-Teachers' Knowledge Increase During Their Thesis?

Table 40 shows the descriptive results (mean and standard deviations) and the correlation between the variables of ownership, sense-making, agency, participants' engagement with the inquiry, and inquiry skills. Table 41 shows the squared correlation coefficient of the relationships.

Table 40: Means, standard deviations, and correlations between the variables of ownership, sense-making, agency, participants' engagement, and knowledge increase (n=154).

Variable		Ownership	Sense-making	Agency (negotiation of student identity)	Agency (influence on one's work)	Participants' engagement with the inquiry
	M (SD)	4.46 (0.57)	4.04 (0.77)	3.79 (0.73)	4.09 (0.72)	3.53 (0.95)
Developing theoretical knowledge	3.97 (0.77)	0.23 ^a	0.40 ^b	0.49 ^b	0.31 ^b	0.36 ^b
Developing practical knowledge	3.92 (0.76)	0.31 ^b	0.48 ^b	0.50 ^b	0.28 ^b	0.37 ^b
Developing reading and writing knowledge	4.08 (0.66)	0.31 ^b	0.49 ^b	0.58 ^b	0.32 ^b	0.33 ^b

^a $p < 0.006$. Bonferroni correction $0.05/8 = 0.006$

^b $p < 0.001$. Bonferroni correction $0.01/8 = 0.001$

Table 41: Squared correlation coefficients between the variables of ownership, sense-making, agency, participants' engagement, and knowledge increase.

Variable	Ownership	Sense-making	Agency (negotiation of student identity)	Agency (influence on one's work)	Participants' engagement with the inquiry
Developing theoretical knowledge	5.3 ^a	15.8 ^b	24.1 ^b	9.6 ^b	13.2 ^b
Developing practical knowledge	9.6 ^b	23.3 ^b	24.6 ^b	7.8 ^b	13.9 ^b
Developing reading and writing knowledge	9.3 ^b	23.9 ^b	33.3 ^b	10.0 ^b	10.6 ^b

^a $p < 0.006$. Bonferroni correction $0.05/8 = 0.006$

^b $p < 0.001$. Bonferroni correction $0.01/8 = 0.001$

The results show that there is a positive correlation between the aforementioned variables and the variables related to knowledge increase. All 20 relationships between these variables are marked statistically significant and the average shared variation among the variables in these relationships is nearly 16%. The relationships with the dimension of agency titled 'negotiation of student identity' demonstrated the highest shared variation in all cases. The results are presented in more detail regarding each of the three variables related to knowledge increase in the paragraphs that follow.

Theoretical knowledge increase demonstrated on average the lowest, compared to the other knowledge variables, shared variation with the other variables at about 14%. The relationship of theoretical knowledge increase with negotiation of student identity (agency), is by far the strongest one with shared variation at 24.1%. Relationships with sense-making and participants' engagement with the inquiry are quite strong as well with shared variation at 15.8% and 13.2% respectively. A bit lower than 10% is the shared variation with the dimension of agency titled 'influence on one's work'. Lastly, the weakest relationship occurred with ownership at 5.3%.

Practical knowledge increase demonstrated shared variation with the other variables at about 16%. Relationships with negotiation of student identity (agency) and sense-making demonstrated the highest shared variation at about 24%. Relationship with participants' engagement with the inquiry is quite strong as well with shared variation at 13.9%. Lastly, the weakest relationships are with ownership and influence on one's work (agency) at 9.6% and 7.8% respectively.

Reading and writing knowledge increase demonstrated on average the highest, compared to the other knowledge variables, shared variation with the other variables at approximately 17%. The relationship of theoretical knowledge increase with negotiation of student identity (agency), is by far the strongest one with shared variation at 33.3%. Relationship with sense-making is quite strong as well with shared variation nearly 24%. Relationships with participants' engagement with the inquiry, influence on one's work (agency), and ownership have shared variation at about 10%.

Overall, the findings indicate that the more student-teachers acquired knowledge by conducting their thesis the more they sensed ownership towards their thesis and vice versa. Perceptions of ownership towards an innovation have been connected with acceptance, success, sustainability, and engagement in the literature (Ketelaar et al., 2013; Koster & Dengerink, 2008; Melville, 2008). This outcome contributes to the existing literature on the effects and cultivation of ownership by suggesting that knowledge development due to engagement with a thesis is connected with perceptions of ownership.

When it comes to sense-making, the findings show that the more student-teachers developed knowledge by their engagement with their thesis, the more they made sense of its importance and vice versa. In other words, it can be argued that the knowledge that student-teachers acquired by conducting their thesis helped them make sense of it and, at the same time, by making sense of their thesis, they acquired knowledge. Contrarily, student-teachers who made little sense of their thesis, they did not acquire so much knowledge by conducting it and, at the same time, by not gaining sufficient knowledge by conducting their thesis they did not make much sense of it.

With reference to agency, the findings show that the extent to which student-teachers achieved agency was related to the extent they developed their knowledge. This outcome was

more evident in the achievement of agency related to the negotiation of the student identity rather in the influence that student-teachers achieved in their own work. In simple terms, student-teachers who worked out their student identity and altered the way they viewed themselves as students due to their engagement with the thesis acquired more knowledge in all areas questioned compared to the student-teachers who worked out their student identity to a lesser extent. Similarly, student-teachers who managed to take the most important decisions regarding their thesis without any influence acquired more knowledge compared to the student-teachers who were influenced by external factors.

This outcome is in contrast to a significant extent to the connection found between agency and practicing of inquiry skills, where with half of the inquiry skills no relationship was found and the ones that emerged were weak. In other words, there is an important difference between practice of inquiry skills and knowledge development as regards achievement of agency. Whereas the former is only irregularly and weakly connected with agency, the latter is regularly, and often strongly, connected with agency.

Lastly, the findings show that the more participants were engaged with the inquiry, the more student-teachers developed their knowledge about conducting inquiry. Although this outcome underlines the crucial role of participants in an inquiry and demonstrates another facet of it, it is hard to interpret how exactly this connection works. What is even more troublesome is that the practice of inquiry skills, which arguably has more relevance with and dependence on participants' engagement, demonstrated weaker connections with participants' engagement compared to knowledge acquired.

To What Extent are Emotions Related to Student-Teachers' Knowledge Increase During Their Thesis?

Table 42 shows the descriptive results (mean and standard deviations) and the correlation between the variables of emotions and knowledge increase. Table 43 shows the squared correlation coefficient of the relationships.

Table 42: Means, standard deviations, and correlations between the variables of emotions and knowledge increase (n=154).

Variable		Positive emotions	Negative emotions
	M (SD)	3.46 (0.77)	2.14 (0.96)
Developing theoretical knowledge	3.97 (0.77)	0.36 ^b	-0.13
Developing practical knowledge	3.92 (0.76)	0.37 ^b	-0.22 ^a
Developing reading and writing knowledge	4.08 (0.66)	0.39 ^b	-0.16

^a $p < 0.01$. Bonferroni correction $0.05/5 = 0.01$

^b $p < 0.002$. Bonferroni correction $0.01/5 = 0.002$

Table 43: Squared correlation coefficients between the variables of emotions and knowledge increase.

Variable	Positive emotions	Negative emotions
Developing theoretical knowledge	12.9 ^b	1.6
Developing practical knowledge	13.6 ^b	4.7 ^a

Developing reading and writing knowledge	15.1 ^b	2.4
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^a $p < 0.01$. Bonferroni correction $0.05/5 = 0.01$

^b $p < 0.002$. Bonferroni correction $0.01/5 = 0.002$

The results show that there is a positive, statistically significant correlation between positive feelings and all three aspects of knowledge increase, while there is a negative, statistically significant, correlation between negative feelings and practical knowledge increase. The shared variation between positive feelings and knowledge increase is between 13-15%, while the shared variation between practical knowledge increase and negative feelings is at 4.7%.

Thus, the more student-teachers sensed positive emotions, such as enjoyment, enthusiasm, pride, and so on, the more they developed knowledge and vice versa. On the other hand, it is shown that negative emotions had a weak relationship and only with the development of practical knowledge.

While there are no studies that investigate knowledge development in student-teachers and emotions, two studies can be helpful in this discussion. First, Gaines et al. (2019) have shown that positive emotions promote engagement with professional development opportunities, while negative emotions disengagement. It is reasonable to assume that engagement with professional development is also connected with learning and knowledge development and as such this outcome complements the aforementioned study. From another angle, Hascher and Hagenauer (2016) have revealed that student-teachers who were more open to educational theories were more likely to trigger positive emotions. Based on this finding, it could be argued that openness and acquisitions of new knowledge is more likely to cultivate positive emotions.

To What Extent are Perceptions Regarding Support Received From the University and the Supervisor are Related to Student-Teachers' Knowledge Increase During Their Thesis?

Table 44 shows the descriptive results (mean and standard deviations) and the correlation between the variables of support and inquiry skills. Table 45 shows the squared correlation coefficient of the relationships.

Table 44: Means, standard deviations, and correlations between the variables of support and knowledge increase (n=154).

Variable	M (SD)	Support from the university 3.42 (1.05)	Support from the supervisor 4.01 (1.03)
Developing theoretical knowledge	3.97 (0.77)	0.19	0.33 ^b
Developing practical knowledge	3.92 (0.76)	0.22 ^a	0.21 ^a
Developing reading and writing knowledge	4.08 (0.66)	0.30 ^b	0.27 ^b

^a $p < 0.01$. Bonferroni correction $0.05/5 = 0.01$

^b $p < 0.002$. Bonferroni correction $0.01/5 = 0.002$

Table 45: Squared correlation coefficients between the variables of support and knowledge increase.

Variable	Support from the university	Support from the supervisor
Developing theoretical knowledge	3.5	11.2 ^b

Developing practical knowledge	4.8 ^a	4.5 ^a
Developing reading and writing knowledge	8.8 ^b	7.2 ^b

^a $p < 0.01$. Bonferroni correction $0.05/5 = 0.01$

^b $p < 0.002$. Bonferroni correction $0.01/5 = 0.002$

The results show that there is a positive correlation between knowledge development and support received from the supervisor and the university. From the 6 total relationships between the variables that are correlated, 5 are marked statistically significant (83%) and the shared variation among the correlated variables is on average at 7%. The results are presented in more detail regarding each aspect of knowledge development in the following paragraphs.

Increase of theoretical knowledge was correlated only with the support from the university. The relationship is the strongest among the other relationships of knowledge increase and support, well over 10%.

Practical knowledge increase demonstrated weak relationships both with support from the university and the supervisor at about 8%.

These findings show that support is important for student-teachers' knowledge development, yet only to a limited extent. This may indicate that the support received was not very helpful in the development of student-teachers' knowledge or that student-teachers developed autonomous skills during their thesis and worked mostly independently.

It should be noted, however, that though the role of support in knowledge development was not found to be very important, still it is more important compared to its role in the development of student-teachers' inquiry skills.

7.6.4. What are the Differences among Clusters of Student-Teachers When Considering Components of the Student-teacher Identity as Inquirer?

The fourth research question is broken down to six sub-questions. The first sub-question is related to the different student-teacher profiles based on their inquiring skills. The second sub-question is related to differences between the different student-teacher profiles regarding the information literacy, research, and professional skills they have. The third sub-question is related to differences between the different student-teacher profiles regarding perceptions of ownership, sense-making, agency, and participants' engagement. The fourth sub-question is related to differences between the different student-teacher profiles regarding emotions experienced during the thesis. The fifth sub-question is related to differences between the different student-teacher profiles regarding the support received from the university and the supervisor during the thesis. Lastly, the sixth sub-question is related to differences between the different student-teacher profiles regarding the knowledge they have gained during their thesis.

What are the Different Student-Teacher Profiles Based on Their Inquiring Skills?

As explained in the methodology, the number of clusters was determined through five different methods.

First, the dendrogram showed that from a three-cluster solution to a two-cluster solution the distance is greatly increased, therefore a three-cluster solution is suggested.

Second, although the scree plot does not show a clear elbow, we can observe that there is a sharp increase when switching from three-cluster to a two-cluster solution, whereas the increase between a three-cluster and a four-cluster solution does not seem to be so important.

Third, the ω_k statistics for a three-, four-, and five-cluster solution was calculated and it was revealed that the minimum ω_k results for a three-cluster solution.

Fourth, the cluster centers produced by the Ward's Method were tested by utilizing the k-means procedure and it was found very high degree of agreement and overlap. More specifically, one of the centers has not changed at all, the highest percentage change in cluster centers is less than 3%, and the average percentage change in cluster centers is less than 1%. What is more important, however, is that the nature of the centers remained almost intact. When the objects' cluster affiliations were contrasted using crosstabs it was found that the two analyses have an overlap of over 90%, which is very satisfactory as less than one tenth of all items appear in a different cluster when using the k-means procedure.

Fifth, the resulted outcome satisfied the criteria of substantiality, parsimoniousness, interpretability, and predictive validity to a large extent. More specifically, each of the resulted clusters contains at least 20 items (the smallest cluster contains 23 items), which was considered sufficiently large for a sample of 154 items since the smallest cluster has more than one tenth of the total items of the whole sample. Therefore, the three-cluster solution is parsimonious enough, allows prediction of the related variables, and it can be logically explained as it is discussed next.

As can be seen in Table 46, from the total 12 associations, 11 are marked statistically significant (92%) based on Mann-Whitney U test. Therefore, significant differences in inquiry skills were found in all but one of the total comparisons that can be made between the three different clusters of student-teachers. What is more, in 10 out of the 12 comparisons (83%) the effect size is high, which signifies that the different clusters are accountable for much of the variability.

Table 46: Differences between the three clusters of student-teachers (A, B, and C) in inquiry skills.

	A (n=47) M (SD)	B (n=84) M (SD)	C (n=23) M (SD)	Statistical significance and effect size
Developing theoretical understanding	4.71 (0.31)	3.97 (0.38)	4.17 (0.41)	A ^{be} > B, C C ^{ac} > B
Designing and implementing	4.59 (0.43)	3.96 (0.31)	2.76 (0.58)	A ^{be} > B, C B ^{be} > C
Evaluating and reflecting	4.68 (0.32)	3.92 (0.23)	3.27 (0.97)	A ^{be} > B, C B ^{be} > C
Writing and presenting	4.81 (0.23)	4.22 (0.41)	4.06 (0.82)	A ^{be} > B, C

^a $p < 0.05$; ^b $p < 0.01$; ^c $\eta^2 > 0.01$; ^d $\eta^2 > 0.06$; ^e $\eta^2 > 0.14$

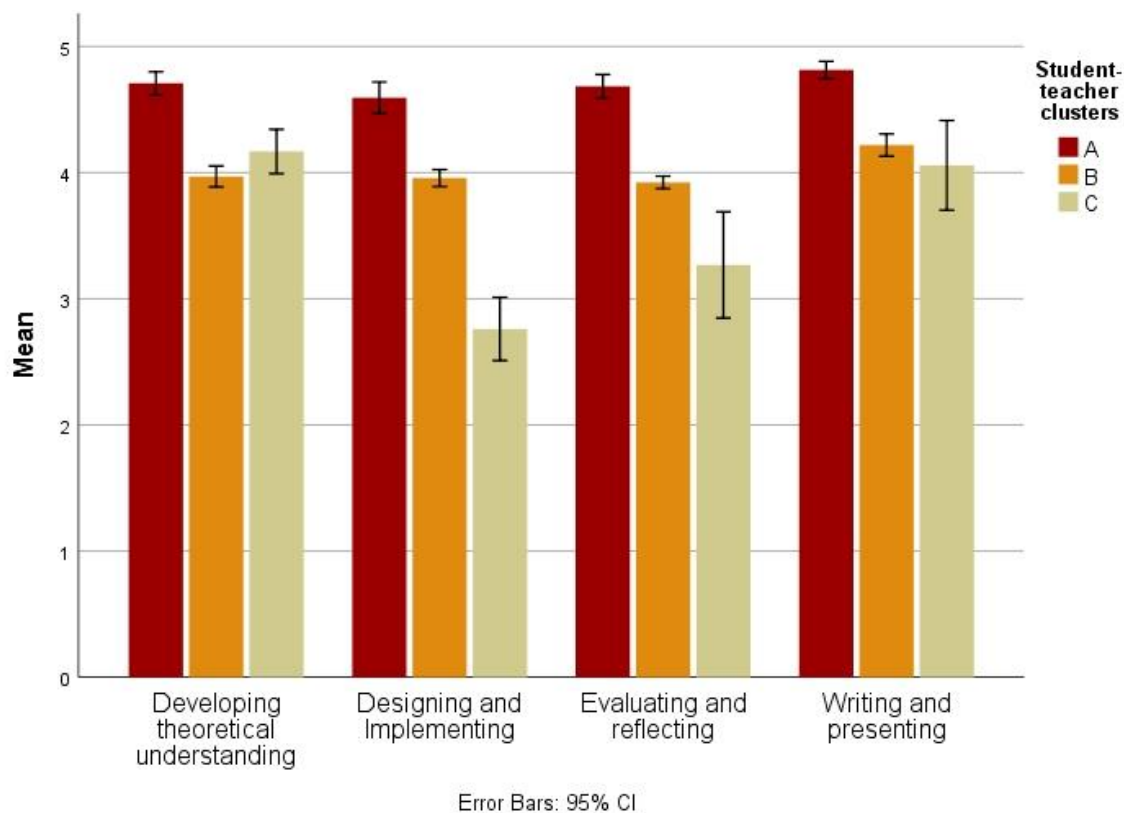
More specifically, cluster A demonstrates significant difference with high effect size from the other two clusters in all four inquiry skills. There is also a significant difference with high effect size between clusters B and C in designing and implementing skills as well as in evaluating and reflecting skills. In developing theoretical understanding skills cluster C has higher mean from B and this association is significant, but with low effect size. Lastly, in writing and presenting skills there is no significant difference between clusters B and C.

As can be seen in Figure 2 and Table 46, cluster A has the highest mean in all inquiry variables and cluster B has higher mean values compared to cluster C in three out of four inquiry skills. Taking into account that the average means of cluster A are above 4.5, student-teachers who form cluster A have practiced the inquiry skills to a *very high* degree during the thesis. As regards cluster B, its means have a close to 4 value, therefore student-teachers who form cluster B have practiced the inquiry skills to a *high* degree during the thesis. Lastly, the means in cluster C range from 2.8 to 4.1, therefore student-teachers who form cluster C have practiced some inquiry skills to a *high* degree while other skills to a *moderate* degree during the thesis. Therefore, the three clusters were labeled as: cluster A: *student-teachers who*

practiced inquiry skills to a very high degree, cluster B: student-teachers who practiced inquiry skills to a high degree, and cluster C: student-teachers who practiced some inquiry skills to a moderate while others to a high degree.

Accordingly, it is reasonable to claim that the student-teacher as inquirer identity is developed to a very high degree in teachers in cluster A, high degree in teachers in cluster B, and to a moderate-high degree in teachers in cluster C.

Figure 2: Clustered bar chart displaying the means for the cluster solution of the student-teachers across the inquiry skills.



What are the Differences Among Clusters Of Student-Teachers When Considering Information Literacy, Research, Professional, English Language Skills and Experience in Conducting Thesis?

Overall, statistically significant differences were found between the three clusters in information literacy, research, and professional skills, whereas no statistically significant

difference was found in English language skills and experience in conducting thesis (Table 47). The results are analysed in more detail in the following paragraph.

Table 47: Differences between the three clusters of student-teachers (A, B, and C) in information literacy, research, professional, English language skills and experience in conducting thesis.

	A (n=47) M (SD)	B (n=84) M (SD)	C (n=23) M (SD)	Statistical significance and effect size
Information literacy skills	4.19 (0.55)	3.62 (0.62)	3.96 (0.62)	A ^{be} > B C ^{ac} > B
Research skills	3.82 (0.66)	3.27 (0.54)	3.10 (0.72)	A ^{be} > B, C
Professional skills	4.11 (0.54)	3.56 (0.52)	3.64 (0.66)	A ^{be} > B A ^{ad} > C
English language skills	3.38 (0.92)	3.29 (0.86)	3.61 (0.89)	-
Experience in conducting thesis	3.68 (1.02)	3.35 (1.29)	3.78 (1.35)	-

^a $p < 0.05$; ^b $p < 0.01$; ^c $\eta^2 > 0.01$; ^d $\eta^2 > 0.06$; ^e $\eta^2 > 0.14$

On average, student-teachers in clusters A and C have high information literacy skills, whereas student-teachers in cluster B have moderate to high skills. The effect size of the association between clusters A and B is high, whereas the effect size between clusters C and B is low. Student-teachers in cluster A have high research skills, whereas student-teachers in clusters B and C have moderate to high skills (high effect size). Student-teachers in cluster A have high professional skills, whereas student-teachers in clusters B and C have moderate to high skills (moderate and high effect size respectively).

Hence, it is reasonable to claim that research and professional skills are important towards higher practice of inquiry skills.

On the other hand, these findings signify that differences in English language skills and experience in conducting a thesis are not that important for the development of the

student-teacher identity as inquirer. Nevertheless, it should be also considered that all student-teachers reported sufficient experience in conducting a thesis and that less than one out of six reported elementary level in English language, while the rest reported intermediate or higher.

In terms of differences between the clusters in information literacy skills, the results were barely expected as no difference emerged between teachers in cluster A and cluster C and what is more surprising is that teachers in cluster C reported higher skills compared to teachers in cluster B. Although the strength of the latter outcome was weak, it still demonstrates that the precise level of information literacy skills was hardly important for the practice of inquiry skills by student-teachers.

What are the Differences among Clusters of Student-Teachers When Considering Ownership, Sense-Making, Agency, and Participants' Engagement?

Overall, statistically significant differences were found between the three clusters in ownership, sense-making, agency (influence on one's work), and participants' engagement, whereas no statistically significant difference was found in the dimension of agency regarding negotiation of student identity (Table 48). The results are analysed in more detail in the following paragraph.

Table 48: Differences between the three clusters of student-teachers (A, B, and C) in ownership, sense-making, agency, and participants' engagement.

	A (n=47) M (SD)	B (n=84) M (SD)	C (n=23) M (SD)	Statistical significance and effect size
Ownership	4.77 (0.43)	4.34 (0.54)	4.28 (0.69)	A ^{be} > B, C
Sense-making	4.26 (0.83)	3.96 (0.68)	3.87 (0.88)	A ^{bd} > B A ^{ac} > C
Agency – negotiation of student identity	3.97 (0.8)	3.74 (0.69)	3.62 (0.68)	-
Agency – influence on one's work	4.27 (0.73)	4.02 (0.68)	4.00 (0.81)	A ^{ac} > B

Participants' engagement	3.66 (0.94)	3.63 (0.88)	2.92 (1.01)	A ^{ad} > C B ^{bd} > C
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^a p<0.05; ^b p<0.01; ^c η^2 >0.01; ^d η^2 >0.06; ^e η^2 >0.14

On average, student-teachers in cluster A reported very high ownership, whereas student-teachers in clusters B and C reported high ownership (high effect size). Student-teachers in cluster A reported above high sense-making, whereas student-teachers in clusters B and C reported high sense-making (low-moderate effect size). Student-teachers in cluster A reported above high agency in the dimension of influence on one's work, whereas student-teachers in cluster B high (low effect size). Lastly, student-teachers in clusters A and B reported moderate to high participants' engagement, whereas student-teachers in cluster C reported moderate participants' engagement (moderate effect size).

All in all, it seems that student-teachers developed a high sense of ownership of their thesis and made sense of their thesis to a high level even when they managed to develop their student-teacher as inquirer identity to a moderate-high degree.

Contrarily, when it comes to agency, merely one difference between the three clusters was proven to be statistically significant. Thus, all three clusters of student-teachers achieved high agency both in the domain of negotiation of student identity and in the domain of influence on one's work. Whereas the three clusters can be ordered from the higher achieved agency (cluster A) to the lower (cluster C) based on their average, the only difference that emerged from the statistical analysis was between student-teachers in cluster A and B in the domain of influence one's work. Therefore, it appears that although achievement of agency to a high extent is crucial for the practice of inquiry skills, it does not affect the extent to which this will happen, that is to a low, medium, or high extent.

Lastly, the findings demonstrate that at least a moderate engagement of participants is required for the realization of the thesis and, subsequently, for practicing inquiry skills.

What are the Differences Among Clusters of Student-Teachers When Considering Emotions Experienced During the Thesis?

Overall, statistically significant differences were found between the three clusters in positive and negative emotions (Table 49). On average, student-teachers in cluster A reported close to high positive emotions, whereas student-teachers in clusters B and C reported moderate positive emotions (moderate to high effect size). As regards negative emotions, a low effect size association was found between student-teachers in clusters A and B with the former reporting lower negative emotions.

Table 49: Differences between the three clusters of student-teachers (A, B, and C) in emotions.

	A (n=47) M (SD)	B (n=84) M (SD)	C (n=23) M (SD)	Statistical significance and effect size
Positive emotions	3.83 (0.83)	3.35 (0.67)	3.11 (0.71)	A ^{bd} > B A ^{be} > C
Negative emotions	1.92 (0.95)	2.23 (0.95)	2.23 (0.97)	A ^{ac} > B

^a $p < 0.05$; ^b $p < 0.01$; ^c $\eta^2 > 0.01$; ^d $\eta^2 > 0.06$; ^e $\eta^2 > 0.14$

On the whole, it could be stated that all three clusters more frequently and more intensely experienced positive emotions rather than negative emotions. These results demonstrate that the development of the student-teacher as inquirer identity is accompanied by both positive and negative emotions, though positive emotions are far more prominent.

What are the Differences Among Clusters of Student-Teachers When Considering Their Perceptions Regarding the Support Received From the University and the Supervisor During the Thesis?

No statistically significant differences were found between the three clusters in their perceptions regarding the support they received from the university and the supervisor (Table 50).

Table 50: Differences between the three clusters of student-teachers (A, B, and C) in their perceptions about the support they received.

	A (n=47) M (SD)	B (n=84) M (SD)	C (n=23) M (SD)	Statistical significance and effect size
Support from the university	3.41 (1.25)	3.45 (0.93)	3.30 (1.01)	-
Support from the supervisor	4.13 (1.12)	3.98 (0.97)	3.87 (1.11)	-

^a $p < 0.05$; ^b $p < 0.01$; ^c $\eta^2 > 0.01$; ^d $\eta^2 > 0.06$; ^e $\eta^2 > 0.14$

In general, student-teachers reported that they received moderate support from the university and their classmates, while they received high support from their supervisor. This outcome highlights that though support from the academic environment, especially from the supervisor, is important for the practice of inquiry skills by the student-teachers, ultimately, it hardly makes any difference as regards the extent to which the inquiry skills are practiced. In simple terms, student-teachers who practiced their inquiry skills to different extents, received, more or less, support of equal magnitude.

What are the Differences Among Clusters of Student-Teachers When Considering Perceptions Regarding Knowledge Increase During the Thesis?

Overall, statistically significant differences were found between the three clusters in practical knowledge increase and reading and writing knowledge increase, whereas no

statistically significant difference was found in theoretical knowledge increase (Table 51). On average, student-teachers in cluster A reported over high practical knowledge increase, whereas student-teachers in clusters B and C reported moderate to high knowledge increase (moderate-high effect size). Student-teachers in cluster A reported over high reading and writing knowledge increase, whereas student-teachers in cluster B reported close to high knowledge increase (moderate effect size).

Table 51: Differences between the three clusters of student-teachers (A, B, and C) in perceptions regarding knowledge increase.

	A (n=47) M (SD)	B (n=84) M (SD)	C (n=23) M (SD)	Statistical significance and effect size
Developing theoretical knowledge	4.07 (0.94)	3.94 (0.59)	3.86 (0.93)	-
Developing practical knowledge	4.28 (0.74)	3.85 (0.54)	3.47 (1.1)	A ^{bd} > B A ^{be} > C
Developing reading and writing knowledge	4.33 (0.72)	3.93 (0.60)	4.15 (0.62)	A ^{bd} > B

^a $p < 0.05$; ^b $p < 0.01$; ^c $\eta^2 > 0.01$; ^d $\eta^2 > 0.06$; ^e $\eta^2 > 0.14$

Overall, it appears that there are quite different perceptions among the three clusters regarding each type of knowledge.

In all three clusters it was reported that the theoretical knowledge was increased to a high extent, while no difference was found between them. Thus, it appears that practice of inquiry skills was accompanied by theoretical knowledge development regardless of the extent to which these were practiced.

Similarly, in terms of reading and writing knowledge development, in all three clusters it was reported that knowledge increased to a high extent, while only one statistically significant difference between the clusters emerged. Thus, it was found that knowledge

increase was higher in cluster A compared to cluster B. Add to that, cluster A had higher average than cluster C, though this relationship was not confirmed statistically. On the other hand, quite surprisingly though the relationship was not confirmed statistically, it came out that cluster C had higher average from cluster B. Hence, it could be argued that in general even when student-teachers practiced their inquiry skills to a low extent, they managed to increase their reading and writing knowledge to a rather high extent.

Lastly, while based on their average on practical knowledge acquisition the three clusters can be ordered as very high (cluster A), high (cluster B), and moderate (cluster C), the difference between cluster B and C was not found statistically significant. Hence, it turns out that even when inquiry skills were practiced to a moderate-high degree, student-teachers acquired practical knowledge at a close to high extent.

7.7. Synopsis

In this chapter the research settings, methods, and instruments utilized in the second study of the thesis were presented and the corresponding findings were reported.

Data Collection and Demographics

The questionnaire on student-teachers' perspectives regarding inquiry was sent to the students of three online postgraduate programmes who attended the master thesis project at the UOC during academic years 2019-2020. In total, 154 students responded to the questionnaire. The majority of the respondents were aged between 21-40, while more than two out of ten over 40. Most respondents had a degree in education and a significant part of the respondents in a specialized area (e.g. music, sociology) or in psychology. The majority of the respondents had at least intermediate level in English, yet an important part reported low level. More than half of the respondents were working in a school as teachers and one-fourth in a psycho-pedagogical orientation, while the rest were not working at the time or

they were working in a position not relevant with education or psychology. The vast majority of the respondents had working experience and/or they were working at the time and the typical respondent had nine years of working experience.

As regards the thesis project, nearly half of the master thesis projects were based in the area of learning difficulties and the rest in psychopedagogy and education and ICT. Over half of the projects included an educational or psychoeducational intervention while the rest some kind of empirical work. Lastly, the majority of the respondents reported that they had experience related in conducting a master thesis project.

Questionnaire

Topics and issues considered during the design and construction of the questionnaire were briefly discussed. As regards sampling methods, judgmental sampling was chiefly utilised for selecting the participants.

The questionnaire included ten instruments on concepts related to the topic of the thesis. More specifically, the questionnaire included instruments on: information literacy skills; research skills; professional skills; ownership; sense-making; agency; inquiry skills; experienced emotions; knowledge acquired; support from people. The construction of the questionnaire was completed through four stages (creation of items, review and addition of items, review, translation into Spanish and Catalan).

PCA

The PCA procedure for extracting the main components from each measure is described before reporting the outcomes of the PCA for each measure. More specifically, the following components emerged from the measures:

- information literacy skills;

- research skills;
- professional skills;
- ownership;
- sense-making;
- agency: influence on one's work;
- agency: negotiation of student identity;
- inquiry skills: developing theoretical understanding;
- inquiry skills: designing and implementing;
- inquiry skills: evaluating and reflecting;
- inquiry skills: writing and presenting;
- positive emotions;
- negative emotions;
- developing theoretical knowledge about conducting inquiry;
- developing practical knowledge about conducting inquiry;
- developing knowledge on academic reading and writing;
- support from the supervisor;
- support from the university;
- participants' engagement with the inquiry.

Findings

Student-teachers reported quite high information literacy, research, and professional skills, yet there was a quite high variation in their responses. They confirmed that they practiced several inquiry skills and at quite high extent during their thesis.

Student-teachers perceived that they increased their knowledge on all three dimensions investigated (personal learning dimension, different types of knowledge,

developing inquiring-related processes). They also reported that the supervisor and other people from the university have helped them during the thesis and that affected people from the thesis were supportive

The relationships between inquiry skills and other variables were investigated. A positive correlation with information literacy skills, research skills, and professional skills was found, while no correlation emerged with English skills and experience in conducting thesis. Add to that, a positive correlation with ownership, sense-making, agency, participants' engagement, and positive feelings. Moreover, support received from the supervisor was partly correlated to inquiry skills, while support from others was not correlated. Lastly, a positive correlation with practical knowledge as well as reading and writing knowledge was found, while no correlation emerged between theoretical knowledge and inquiry skills.

The relationships between knowledge increase and other variables were investigated. No correlation emerged neither with information literacy, research, professional, and English language skills nor with experience in conducting thesis. Contrarily, a positive correlation with ownership, sense-making, agency, and participants' engagement was found. A positive correlation with positive emotions was found, while negative emotions were negatively correlated with practical knowledge only. Lastly, there was a positive correlation with the support received from the supervisor and the university.

The different clustering methods showed a three-cluster solution. The three clusters are clearly distinguishable and were labeled as: cluster A: *student-teachers who practiced inquiry skills to a very high degree*, cluster B: *student-teachers who practiced inquiry skills to a high degree*, and cluster C: *student-teachers who practiced some inquiry skills to a moderate while others to a high degree*.

Several differences emerged between the three clusters in information literacy (A, C>B), research (A>B, C), and professional skills (A>B, C), whereas no difference was found in English language skills and experience in conducting thesis.

The three clusters can be ordered from high to low in ownership and sense-making (A>B>C), whereas in agency only one difference emerged (A>B). With reference to participants' engagement cluster C showed lower values from the other two clusters (A, B>C). In positive emotions, cluster A showed higher values from the other two clusters (A>B, C), while in negative emotions only one difference emerged (A>B). No differences were found between the three clusters in their perceptions regarding the support they received from the university and the supervisor. Lastly, cluster A showed higher values from the other two clusters (A>B, C) in practical knowledge development and higher value from cluster B in reading and writing knowledge development (A>B), while no difference was found in theoretical knowledge development.

8. Conclusions

8.1 Introduction

The main aims of this chapter are to summarise the main findings of this thesis and to reach some relevant conclusions regarding the inquirer identity in the two settings investigated. In addition, the most important limitations of this thesis are considered, suggestions for further research are made, and, finally, some implications for education are put forth.

The chapter begins with the results of the first study. Hence, section 7.2. compares the inquiry skills of the teacher-inquirer identity as these have been identified in the literature versus the empirical results. Section 7.3. discusses the relationships among the teacher-inquirer identity components and, after that, section 7.4. examines the differences between the teacher-inquirer identity profiles and evaluates the importance of the components.

The chapter then moves to the results of the second study and follows the same structure. Thus, section 7.5. compares the inquiry skills of the student-teacher as inquirer identity as these have been identified in the literature versus the empirical results. Next, section 7.6. discusses the relationships among the components of the student-teacher as inquirer identity and, section 7.7. examines the differences between the student-teacher as inquirer identity profiles and evaluates the importance of the components.

After discussing the results of the two studies, the chapter moves to the last three sections. In section 7.8. the limitations of this research are considered and in section 7.9. a few suggestions for further research are made. Finally, section 7.10. puts forward a few educational implications from the results of this thesis.

8.2. Identified Inquiry Skills of the Teacher-inquirer Identity

Based on the literature five categories of inquiry skills, namely searching and focusing, understanding and exploring, designing and implementing, evaluating and reflecting, writing and presenting, have been identified. However, findings from the data analysis showed that this particular group of Greek teachers perceived six main underlying components: (a) searching, (b) understanding, (c) exploring, (d) designing, implementing, evaluating, and reflecting, (e) writing, and (f) presenting.

There is much overlap between the proposed model and the empirical outcome since except for focusing, all the other inquiry skills appear in both. However, different categories of skills emerged from the analysis. Hence, five skills which in the theoretical model conceived to be part of a category, formed an independent category by themselves (searching, understanding, exploring, writing, presenting). Thus, it seems that teachers perceive these skills as sufficiently distinguishable. Contrarily, the analysis also showed that four skills (designing, implementing, evaluating, reflecting) form only one component. Accordingly, it seems that this specific group of Greek teachers perceived these four skills as highly interrelated and as such the boundaries between them are blurred. This result resonates the view of action research as a four-stage procedure comprising of stages that are quite relevant to these skills (Mertler, 2017). Lastly, the skill of focusing did not emerge from the empirical analysis, which might show that this skill is not important for the inquiry.

8.3. Relationships Among the Teacher-inquirer Identity Components

In this thesis, the relationships among several components of the teacher-inquirer identity in light of an educational innovation were examined. In the following paragraphs, the outcomes are summarized, the main conclusions are stated, and connections with the literature are drawn.

Relationships Among Skills, Inquiry Skills, and MoE

It has been found that teachers who were engaged with an educational innovation reported a high level in English language skills, which is at least a bit higher compared to the national or the EU average (Eurostat, 2019). Although no relationship emerged between English language and inquiry skills as well as between English language skills and teachers' MoE, the unusually high level of English language skills that teachers reported may indicate that it is a prerequisite skill for engaging with educational innovation.

Similarly, teachers who were engaged with an educational innovation reported a high level in information literacy skills, which seems to be quite higher to the level many teachers in the OECD countries have (OECD, 2019). Yet, again, no relationship emerged between information literacy skills and teachers' MoE, while only a very weak relationship with inquiry skills was found. Same as with English language skills, it seems that the unusually high level of information literacy skills may indicate that it is a prerequisite skill for engaging with an educational innovation.

Relationships Among Ownership, Inquiry Skills, and MoE

Perceptions of ownership were found to be related to all inquiry skills as well as to all teachers' MoE. These findings add to the literature that perceptions of ownership are related to the extent to which teachers are willing to engage with an educational innovation (Berrill & Whalen, 2007) or inquiry-based working (Baan et al., 2020), and, accordingly, to the extent to which they practiced their inquiry skills. In the same vein, it was shown that perceptions of ownership are related with the extent to which teachers are practicing their writing and presenting skills or, as Ketelaar et al. have argued, by an increased willingness to communicate about the educational innovation (2012, 2014).

With reference to teachers' MoE, the results corroborate the literature that perceptions of ownership are related to the extent that teachers feel the educational innovation is important for them and their students, their efforts to integrate technological tools and the innovation into classroom practice as well as manage the workload, the time and energy they are inclined to invest for preparation in the subject matter, and their understanding that they need to change their teaching methods (Ketelaar et al., 2014). Add to that, this thesis has strengthened the evidence that teachers need a supportive school environment to take the risk and implement an educational innovation (Le Fevre, 2014) or engage with inquiry-based working (Baan et al., 2020).

Relationships Among Sense-making, Inquiry Skills, and MoE

Teachers' sense-making of the educational innovation was found to be related to all inquiry skills and all teachers' MoE.

Thus, the more a teacher made sense of the educational innovation, the more he/she put on practice his/her inquiry skills and vice versa, with searching skills having a stronger connection with sense-making, then designing, implementing, evaluating, and reflecting skills, and, lastly, exploring, understanding, and writing skills. These outcomes corroborate the literature on the connection of sense-making with teachers' engagement with an educational innovation (Pietarinen et al., 2017).

Following the model by Luttenberg et al. (2013) for interpreting these outcomes, stronger connections with sense-making are possible signs of teachers being in a state of assimilation or accommodation of the teacher identity required by the educational innovation, whereas weaker connections with sense-making are possible signs of teachers being in a state of toleration or distantiation. Bearing in mind that different combinations of the four types of sense-making can be found within one teacher in light of educational innovation (Luttenberg

et al., 2013), we could hypothesize that weak connections with sense-making indicate that an anomaly is more possible to occur in the practice of the particular skills, which probably denotes the dominance of a different type of sense-making. To put it simply, teachers may experience more often a state of assimilation or accommodation of the teacher identity required by the educational innovation when they are practicing their searching, designing, implementing, evaluating, and reflecting skills, while when practicing their understanding, exploring, writing, and presenting skills it is possible that teachers experience more often a state of toleration or distantiation.

As regards relationships of sense-making with teachers' MoE, very strong relationships with being -pedagogical domain- as well as with doing and having -pedagogical activities and teachers' needs domain- were found, strong relationships with being -management of change and disciplinary domains- and doing -technological teaching domain, and a moderate relationship with having -needs related to the school domain. On the whole, this outcome is a prominent example of the notion of teacher identity development as a learning process (e.g. Beauchamp & Thomas, 2009; Beijaard et al., 2004; Geijsel & Meijers, 2005; Rodgers & Scott, 2008), since it is demonstrated that the different ways that teachers constructed meaning of the educational innovation was related with different teacher identity states.

In addition, these findings give evidence for several assumptions regarding the importance of the role of cognitive thinking and understanding for the teacher identity. Hence, it is shown that teachers' sense-making of the educational innovation goes hand-in-hand with their understanding of the need to change their teaching methods and the way they address their students, to manage the increased workload and reconcile the needs of the innovation with the needs of the school syllabus, to integrate technology into classroom activities. Moreover, these findings corroborate the literature that collegial support networks

influence important aspects of a teacher's identity (Laura Thomas et al., 2019) and that working with colleagues can increase opportunities for learning and identity development (Kennedy, 2011). Last but not least, it is demonstrated that a teacher's cognitive thinking (being), actions (doing), and the feedback he/she receives from the environment (having) work jointly towards the development of the teacher's identity.

Relationships Among Agency, Inquiry Skills, and MoE

In contrast with perceptions of ownership and sense-making, it was found that agency is related to only one inquiry skill and some MoE. It is hard to explain why teachers perceived that they achieved agency only while searching for problems and not while they were practicing other skills. One possible explanation is that teachers recognized the critical role of the students in the development of the educational innovation, thus they may perceive that they did not have such an active role in the realization of the innovation or so much control of the decisions because their students played a more important role in the development of the project in nearly every aspect. This result resonates the finding that teacher agency is a complicated construct which cannot be explained by a single element (Pyhältö et al., 2015).

As regards the relationships of the agency with teachers' MoE there were many varieties. Bearing in mind that teacher agency is related to teachers' active efforts to make choices and act despite contextual disparities, it is reasonable to expect strong relationships with all MoE and especially with aspects of doing. Thus, these outcomes only partially can be explained.

Relationships Between MoE and Inquiry Skills

Lastly, several relationships emerged between teachers' perceptions of MoE and the extent they practiced their inquiry skills. Most relationships were found with perceptions of

being -pedagogical domain, though the stronger relationships on average emerged with perceptions of doing and having -pedagogical activities and teachers' needs domain. In the following paragraphs, the relationships between teachers' perceptions of the MoE and practicing of inquiry skills are summarized and interpreted.

Perceptions of being -pedagogical domain- demonstrated mostly moderate relationships with inquiry skills. This outcome shows that there is a clear connection between teachers' understanding of the need to change their teaching methods and the extent to which they put on practice their inquiry skills.

On the other hand, no relationship was found between perceptions of being -management of change domain- and inquiry skills. It is not easy to explain this result; one possible explanation, based on the maxim that taking a research approach to teaching is an inherent part of teachers' work (Lampert, 1984), is that for some teachers the engagement with an educational innovation or with an inquiry may be considered as *modus operandi* and as such they did not feel that their workload was increased due to the educational innovation. Another possible explanation is that simply teachers were not able to manage the increased workload or reconcile the needs of the educational innovation with the needs of the syllabus.

Perceptions of being -disciplinary domain- were only weakly related to understanding, exploring, and designing, implementing, evaluating, and reflecting. In general, it makes sense to argue that teachers' conceptions of being related to the discipline are connected with the extent to which they practice their inquiry skills, since, for instance, teachers who perceive that they must increase their knowledge in the discipline they will study resources, explore what other teachers know, invest time to design lessons on the discipline, and so on. In this line of thinking, it is also logical to assume that searching for

problems in students' learning or communicating their experience is not related to how teachers think of themselves as subject matter experts.

With reference to doing -technological teaching domain- a strong relationship with designing, implementing, evaluating, and reflecting skills was found and weak relationships with understanding, exploring, and writing. The strong relationship clearly reflects teachers' active efforts to integrate technological tools in the teaching and learning process, while the weak relationships indicate the use of technological tools for supporting these efforts.

Teachers' perceptions of doing and having -pedagogical activities and teachers' needs domain- demonstrated the stronger relationships with inquiry skills. These relationships show that teachers' actions and practicing of inquiry skills are quite highly related with teachers' needs from the environment, mainly with the need to achieve better learning for their students but also with the need to find and study relevant resources and get advice and suggestions from more knowledgeable people.

Lastly, there was a wide variety in the relationships between teachers' perceptions of having -needs related to the school domain- and inquiry skills. The very strong relationship with the exploring skills illustrates teachers' needs to reach out to their colleagues and mentors to get advice or to collaborate. Yet, teachers' needs to collaborate do not end in getting advice but may start from searching for problems in students' learning and go further to the design and implementation of lesson plans, the evaluation of the teaching process and students' learning, the reflection on the outcomes, and, finally, the presentation of the outcomes. Overall, these results corroborate the literature regarding the importance of a supportive school environment for engagement with inquiry (Baan et al., 2020; Verhoef et al., 2020). The results also show which inquiry skills are not connected with teachers' needs, that is understanding and writing. Thus, teachers perceive that they do not need or do not get

support from their school and their colleagues neither while studying resources nor while writing a text related to the educational innovation.

8.4. Differences Between the Teacher-inquirer Identity Profiles

In this section, the differences between the different teacher-inquirer identity profiles are summarized and conclusions are drawn regarding the importance of each component in terms of the teacher-inquirer identity profile. In the following paragraphs first, the different teacher-inquirer identity profiles are presented and then the identity components are listed and discussed ordered from the most to the least important.

Three different teacher-inquirer identity profiles have been identified based on the extent to which teachers practiced their inquiry skills in light of educational innovation. Thus, in profiles A, B, and C are included teachers who have practiced their inquiry skills to a high, medium, and low degree accordingly. Subsequently, in terms of the teacher-inquirer identity, it could be argued that it is developed to a high, medium, and low degree in teachers in clusters A, B, and C accordingly. This result is in line with the study by Butler and Schnellert (2012), where it was found that there is a variety in the systematic character of the inquiries that teachers conduct.

Four components, ownership, sense-making, being -pedagogical domain-, and having -needs related to the school domain, were found to be very important in determining the extent to which a teacher will develop the teacher-inquirer identity in light of educational innovation. In other words, different levels of perception in each of these components were found to be connected to different levels of development of the teacher-inquirer identity.

As regards ownership and sense-making were found to be in quite high levels even in the low teacher-inquirer identity profile. The same applies to the perceptions of being -pedagogical domain, though it was found to be at a moderate level in the low teacher-inquirer

identity profile. When it comes to having -needs related to the school domain- all three identity profiles demonstrated lower levels following the same pattern with the inquiry skills, that is high, medium, low.

These outcomes may indicate that teachers need first to experience quite high ownership towards, and sense-making of, the educational innovation for the development of their teacher-inquirer identity. Similarly, teachers may need to understand that they need to change their teaching methods, utilize more student-centered practices, and adapt their teaching to societal needs at least to a moderate extent for the development of their teacher-inquirer identity. Lastly, it appears that even a low level of support from the parents, colleagues, and school administration is vital for the development of the teacher-inquirer identity.

Following the first four components, another four, all related to teachers' perceptions of MoE, were found to be important in determining the extent, at least partially, to which a teacher will develop the teacher-inquirer identity in light of educational innovation. These components can be classified into two categories. The first category is comprised of being -management of change domain, doing -technological domain, and doing and having -pedagogical activities and teachers' needs domain, while only being -disciplinary domain- belongs to the second category. In the first category, no significant difference was found between the medium and low teacher-inquirer identity profiles, whereas in the second no significant difference was found between the high and the medium teacher-inquirer identity profiles.

Thus, being -management of change domain, doing -technological domain, and doing and having -pedagogical activities and teachers' needs domain- are found to be important in determining whether a teacher will develop the teacher-inquirer identity in light of

educational innovation to a high or low-moderate degree. In other words, these components do not determine whether a teacher will develop the teacher-inquirer identity to a low or a moderate degree.

More specifically, it appears that teachers need to understand that they have to manage the change and integrate technological activities at least at a moderate level in order to develop the teacher-inquirer identity. Similarly, teachers should try to utilize more activities in which students are active and learn from the experience and in turn, they need to motivate their students and interact with them at least at a moderate level to develop the teacher-inquirer identity.

Contrarily, perceptions of being -disciplinary domain- were found to be important in determining whether a teacher will develop the teacher-inquirer identity in light of educational innovation to a high-moderate or low degree. To put it simply, perceptions of being -disciplinary domain- do not determine whether a teacher will develop the teacher-inquirer identity to a high or a moderate degree. Thus, it seems that teachers need to understand that they have to increase their knowledge and expertise in the discipline at least at a low level to develop the teacher-inquirer identity. However, perceptions of being -disciplinary domain- do not determine whether a teacher will develop the teacher-inquirer identity to a moderate or high degree; thus, even a moderate level of change in these perceptions of being may be sufficient.

In line with the findings on teacher identity (Avidov-Ungar & Forkosh-Baruch, 2018), these results show that the three MoE are important components of the teacher-inquirer identity as well. However, whereas in teacher identity there is a clear hierarchy regarding the importance of each MoE, it appears that there are slight differences among the three MoE in terms of the teacher-inquirer identity. In other words, teacher-inquirer identity development is

almost equally dependent on how teachers think about themselves, what they do, and what they have from their environment.

8.5. Identified Inquiry Skills of the Student-teacher as Inquirer Identity

Based on the literature five categories of inquiry skills, namely searching and focusing, understanding and exploring, designing and implementing, interpreting/evaluating and reflecting, writing and presenting, have been identified. However, from the statistical analysis four main underlying components emerged: (a) developing theoretical understanding, (b) designing and implementing, (c) evaluating and reflecting, (d) writing and presenting.

Apparently, the suggested model and the empirical outcome are overlapping a lot, since their difference lies in the way searching, focusing, understanding and exploring skills are handled. Hence, focusing and exploring did not emerge from the empirical analysis, which might show that these skills are not important for the inquiry. On the other hand, the empirical analysis showed that searching and understanding form a category, whereas in the suggested model were part of different categories. Therefore, in contrast with the theoretical model, it seems that student-teachers perceive these two skills as interrelated.

8.6. Relationships Among the Student-teacher as Inquirer Identity Components

In this thesis, the relationships among several components of the student-teacher as inquirer identity were examined. The outcomes are summarized and the main conclusions are stated in the paragraphs that follow, while also connections with the literature are drawn.

Relationships Among Previous Experience, Knowledge Development, and Inquiry Skills

It was found that previous experience in conducting a thesis was related neither with the extent to which student-teachers practiced their inquiry skills nor with the development of

knowledge during the thesis. Undoubtedly, these outcomes are unexpected from a cognitive learning theory perspective as it questions the contribution of previous knowledge in the development of skills and knowledge. There are at least three possible explanations for this outcome. First, that student-teachers' previous experiences in conducting a thesis were of much inferior quality and, thus, unhelpful to the current situation. Second, that the knowledge and skills that student-teachers developed in their previous experiences have faded out. Third, in line with the findings of the study by Baan et al. (2019), differences in previous knowledge resulted in only few differences regarding actual involvement with inquiry-based activities.

Relationships Among Skills, Knowledge Development, and Inquiry Skills

Similarly, it was found that English language skills were not related to the extent to which student-teachers practiced their inquiry skills nor with the development of knowledge during the thesis. Taking into account that most student-teachers reported an advanced English language level, this outcome may indicate that though a standard level in English is required for conducting an inquiry, higher levels in English make no difference in the practice of inquiry skills and knowledge development. On the other hand, it may indicate that student-teachers only minimally employed or needed their English language skills during the inquiry and, instead, they depended on their native language.

With reference to information literacy skills, no relationship with knowledge development was found, but some important relationships with the extent to which they practiced their inquiry skills emerged. At first sight, this outcome does not seem logical, especially as regards knowledge development. However, in the context of inquiry-based learning, it has been found that some students do not feel that they have developed their information literacy skills (McKinney, 2014) and they struggle to understand the benefits of inquiry-based tasks as they have been accustomed to a transmission- and factual-based

educational system (McKinney et al., 2011). Thus, this result adds to the literature regarding the importance of information literacy skills for knowledge development.

The same applies to the relationships found among inquiry skills, knowledge development, research, and professional skills. Thus, both research and professional skills were not found related to knowledge development, though both were found related to all inquiry skills. Same as with information literacy skills, it seems that research and professional skills were not considered important towards knowledge development.

Relationships Among Ownership, Knowledge Development, and Inquiry Skills

When it comes to perceptions of ownership, these were found related to all inquiry skills as well as with all types of knowledge development. These findings add to the literature that perceptions of ownership are related with the extent to which teachers are willing to engage with an educational innovation (Berrill & Whalen, 2007) or inquiry-based working (Baan et al., 2020), and to communicate about it (Ketelaar et al., 2012, 2014). Add to that, in this thesis it is also shown that perceptions of ownership, besides acceptance, success, sustainability, and engagement (Ketelaar et al., 2013; Koster & Dengerink, 2008; Melville, 2008), are also related with knowledge development.

Relationships Among Sense-making, Knowledge Development, and Inquiry Skills

Sense-making was found to be related more with knowledge development than with practicing of inquiry skills. These findings show that the extent to which student-teachers made sense of their thesis was related with the knowledge they developed and, thus, sense-making is crucial for knowledge development. On the other hand, it is difficult to explain why sense-making was at best modestly related to the practice of inquiry skills as well as why some skills were more strongly connected than others. The results indicate that many student-teachers probably did not make sense of their thesis while they were designing and

implementing their inquiry and as such they were in a state of toleration or distantiation (Luttenberg et al., 2013). A possible explanation is that not all student-teachers designed and implemented intervention and, subsequently, they could not relate well to their own experience when answering questions about designing and implementing skills. Contrarily, student-teachers did make sense of their thesis while they were evaluating it and reflecting on the outcomes, which illustrates the crucial role of reflecting and evaluating skills in an inquiry.

Relationships Among Agency, Knowledge Development, and Inquiry Skills

Regarding the agency -negotiation of student identity domain- whereas with practicing of inquiry skills only two weak relationships were found, with all types of knowledge very strong relationships emerged. Thus, the extent to which student-teachers worked out their student identity and altered the way they viewed themselves as students due to their engagement with the thesis were related with the knowledge they acquired. Therefore, negotiation of student identity is crucial for knowledge development during a thesis.

On the contrary, it is difficult to explain why negotiation of student identity was found to be related only weakly and only with some inquiry skills (evaluating and reflecting; writing and presenting). Perhaps most student-teachers were not able to negotiate their student identity in the initial stages of the inquiry while they were developing theoretical understanding and subsequently while they were designing and implementing the inquiry. However, by practicing their evaluating and reflecting skills, they also managed to negotiate their student identity which indicates the importance of reflecting and evaluating skills for agency achievement. The same may be true for writing and presenting skills. It is also possible that student-teachers needed time and perhaps to invest themselves in the inquiry to negotiate their student identity.

As regards agency -influence on one's work domain- only moderate and weak relationships emerged. Even though the relationships are not that strong, this finding shows that the extent to which student-teachers managed to take the most important decisions regarding their thesis without any influence was related with the extent to which they acquired knowledge. Finally, same as with the negotiation of student identity type of agency, it is difficult to explain why only weak relationships with evaluating and reflecting as well as with writing and presenting skills were found. Same as before, it could be argued that student-teachers achieved agency when they started practicing their evaluating and reflecting skills and, perhaps, they managed to influence their own work only after they invested time and effort in the inquiry.

These results corroborate the literature regarding the role of the activity for agency achievement by the students as well as that some students achieve more agency than others (Jääskelä et al., 2020). Thus, it appears that developing theoretical understanding as well as designing and implementing are not well-suited for agency achievement. Add to that, it could be also assumed that the weak connections between agency and inquiry skills are due to the different level of agency achievement among students.

Relationships Among Participants' Engagement, Knowledge Development, and Inquiry Skills

With reference to participants' engagement with the inquiry moderate relationships were found with all types of knowledge development, whereas with inquiry skills merely a couple of weak relationships emerged. Overall, it is difficult to explain adequately these outcomes. As regards relationships with knowledge, although this outcome underlines the crucial role of participants in an inquiry and demonstrates another facet of it, it is hard to interpret how exactly this connection works. What is even more troublesome is that the practice of inquiry skills, which arguably has more relevance with and dependence on

participants' engagement, demonstrated weaker connections with participants' engagement compared to knowledge acquired. Bearing in mind that participants' role in an inquiry is crucial during the design and implementation stage, one would expect a stronger connection of participants' engagement with designing and implementing skills. Paradoxically, it seems that student-teachers only limitedly perceived that participants' role was important while they were exercising their designing and implementing skills. It is also puzzling that a relationship with evaluating and reflecting skills emerged, which might imply that student-teachers appreciated the role of participants while they were reflecting and evaluating the inquiry.

Relationships Among Emotions, Knowledge Development, and Inquiry Skills

With reference to emotions, positive emotions were found to be moderately to strongly connected to all inquiry skills and types of knowledge, whereas negative emotions were weakly related only with developing practical knowledge. The differences in strength, though small, might imply that practicing some skills is more emotionally laden than practicing others. On the whole, the results corroborate the literature regarding the role of emotions during teachers' professional development (Gaines et al., 2019), regarding teachers' emotions about their skills (Lohbeck et al., 2018), and regarding the relationship between emotions and openness to educational theories (Hascher & Hagenauer, 2016).

Relationships Among Support Received, Knowledge Development, and Inquiry Skills

With reference to the support received from the university and the supervisor, only one weak relationship was found with the practice of inquiry skills. Hence, it appears that support from the university and classmates was not related to the practice of inquiry skills, while the support from the supervisor was only slightly more helpful.

On the other hand, more connections were found between support and knowledge development, yet most of them were weak. Hence, support received appears to be important for knowledge development but only to a small extent. Overall, these outcomes may indicate that many student-teachers did not find the support received particularly helpful for practicing their inquiry skills and only slightly more helpful as regards knowledge development.

These results are in line with the study by Drennan and Clarke (2009) where it was found that students were moderately satisfied with the support they received from their supervisor during their thesis as well as from the overall support they received from the university and their peers.

Relationships Between Knowledge Development and Inquiry Skills

Lastly, as regards the relationships among practice of inquiry skills and knowledge development, only some significant relationships were found. This outcome indicates that knowledge development about conducting inquiry and practice of inquiry skills rather than going together quite often they are developed independently and perhaps at different rates. While on the first sight this seems to be unexpected, in a study on teachers' engagement with inquiry-based working Baan et al. (2019) concluded that knowledge and skills in an inquiry only minimally influenced teachers' actual involvement in inquiry-based activities as other factors might come into play.

8.7. Differences Between the Student-teacher as Inquirer Identity Profiles

In this section, the differences between the different student-teacher as inquirer identity profiles are summarized and conclusions are drawn regarding the importance of each component in terms of the student-teacher as inquirer identity profile. In the following paragraphs first the different student-teacher as inquirer identity profiles are presented and then the identity components are listed and discussed.

Three different student-teacher as inquirer identity profiles have been identified based on the extent to which student-teachers practiced their inquiry skills during their master thesis. Thus, in profiles A and B are included student-teachers who have practiced their inquiry skills to a very high and high degree accordingly, while in profile C student-teachers who have practiced some inquiry skills to a moderate while others to a high degree. Subsequently, in terms of the student-teacher as inquirer identity, it could be argued that it is developed to a very high, high, and moderate-high degree in teachers in clusters A, B, and C accordingly. Same as with the teacher-inquirer identity profiles, this result is in accordance with the study by Butler and Schnellert (2012), where it was found that some teachers engaged in more systematic inquiry than others.

In sharp contrast to how some components of the teacher-inquirer identity determine the extent to which a teacher will develop the teacher-inquirer identity in light of an educational innovation, it appears that there is no such component of the student-teacher as inquirer identity that can determine the extent to which a student-teacher will develop the inquirer identity during the master thesis. On the other hand, several components were found that are quite important discussed below.

Seven components were found to be important in determining the extent, at least partially, to which a student-teacher will develop the inquirer identity during the thesis. These components can be classified into two categories. The first category is comprised of research and professional skills, ownership, sense-making, positive emotions, and practical knowledge development, while only participants' engagement belongs to the second category. In the first category, no significant difference was found between the high and the moderate-high identity profiles, whereas in the second no significant difference was found between the very high and high identity profiles.

With reference to ownership, sense-making, and practical knowledge development these were found to be in quite high levels even in the moderate-high student-teacher as inquirer identity profile. On the other hand, research and professional skills, as well as positive emotions, were found to be at rather lower levels in all three identity profiles.

The former outcomes may indicate that student-teachers should perceive high ownership towards, and sense-making of, their thesis as well as develop high levels of practical knowledge regarding inquiry for the development of their inquirer identity. Along the same lines are the latter outcomes, though in this case, a moderate level for research and professional skills as well as positive emotions seems to be sufficient for the development of the inquirer identity.

When it comes to participants' engagement it was found to be important in determining whether a student-teacher will develop the inquirer identity only to a moderate-high degree or whether will develop the inquirer identity to high or even very high degree. In other words, participants' engagement does not determine whether a student-teacher will develop the inquirer identity to a high or a very high degree. Taking into account that participants' engagement was a little bit over the moderate level even in the very high inquirer identity profile, it appears that no more than a moderate engagement of participants is required for the development of the inquirer identity in student-teachers.

Overall, these results demonstrate that there are several components that have an impact on the development of the student-teacher identity as an inquirer, yet it seems that none of these components plays a definitive role as regards the extent to which a student-teacher will develop the inquirer identity. In addition, it appears that these components are quite diverse in nature, including previous skills, knowledge development, perceptions of ownership and sense-making, emotions, and even the extent to which participants engaged

with the inquiry. These results are in line with the study by Drennan and Clarke (2009) where it was found that at least five components had an impact on the development of research skills during the master thesis.

8.8. Limitations

Every research study presents several limitations and the current study is not an exception. The most important limitations are discussed in the following paragraphs.

It is necessary first to recognize that online survey research presents several methodological challenges on its own. Thus, it is impossible to check the understandings of the respondents to the questions asked which raises issues of truthfulness and accuracy (Blaxter et al., 2008). Furthermore, the design of the questions in a way that is most appropriate to most respondents results in standardized questions that only superficial cover complex topics (Babbie, 2016). A related issue is that the obtained data provide snapshots of points in time rather than an explanation of the underlying processes (Blaxter et al., 2008). Lastly, survey research is not good at exploring the social context of the respondents (Babbie, 2016).

In addition to the aforementioned conventional limitations of survey research, there are a few limitations in the research design of the current study that need to be highlighted. First, the study constructed a theoretical model of teachers' inquiry skills which, apparently, has not been tested adequately (i.e. by other researchers and/or in other settings) to confirm its validity. Second, the findings should be approached with caution in terms of generalizability, since it is fairly impossible to estimate the actual population of teachers who are engaged with an educational innovation or who are conducting an inquiry as part of their postgraduate studies.

8.9. Implications for Practice

In this section, the implications for the practice of this research are set forth and discussed. In general, the implications are addressed to four different stakeholder groups: a) teachers and student-teachers, b) school leaders and directors, c) educational policy designers, course designers, teacher educators, mentors, and supervisors, and d) researchers, scholars, and academics.

Teachers' Perceptions of Being, Having, and Doing are Important for the Inquiry

What teachers think of themselves as teachers, what feedback they receive from their students, what support they have from the school and parents, and what they do in the classroom, is significantly related with the extent to which they will conduct an inquiry on their own settings. A thorough reflection on these issues before the commencement of the inquiry can be valuable for teachers who wish to engage with inquiry. On the other hand, teacher educators, mentors, supervisors, and course designers who want to cultivate teacher inquiry should help teachers to explore their conceptions and support them in understanding why conducting inquiry could be beneficial.

Do not Underestimate Emotions

The more student-teachers experienced positive emotions the more they gained knowledge about conducting an inquiry and practiced their inquiry skills. Undoubtedly, there is no magic medicine for cultivating positive emotions, yet, surely how student-teachers feel while studying and conducting inquiry deserves more attention by teacher educators, mentors, and supervisors.

Pay Attention to the School Climate

This is connected with the previous implication, but it is approached from a different angle. For inquiry to thrive school leaders and directors should support teachers in their

efforts, encourage collaboration among teachers in the school, and place students in the centre of school activities. The results have shown that even a low support from school administration, colleagues, and parents is necessary for teachers to engage with inquiry.

Ensure Ownership and Sense-making of the Inquiry

In both contexts investigated in this thesis, it was shown that perceptions of ownership and sense-making were strongly related to the practice of inquiry skills. This highlights the importance of teachers experiencing ownership of the inquiry as well as making sense of it. In simple terms, the inquiry that is imposed top-down and it is not well-communicated so that teachers can understand its meaning and feel that it is important for them and their students will probably bring poor results. Contrarily, if teachers are supported in making sense of the inquiry and experience that rather than imposed to them the inquiry is something that belongs to them, then they will practice more their inquiry skills and subsequently, the inquiry will be more fruitful.

Highly Qualified Teachers Engage with Inquiry

In this thesis participants' educational backgrounds, skills, and experience were only superficially investigated, yet, even with minimal data, the results showed that teachers who were engaged with inquiry had higher skills compared to the average. For promoting teacher inquiry educational policy designers should take this outcome into account when designing teacher professional development programmes by i.e. supporting and encouraging teachers with lower skills.

The Context Impacts the Components of the Teacher-inquirer Identity

Although the empirical results corroborated to a large extent the suggested theoretical model regarding the skills of the teacher-inquirer identity, significant variations have emerged as well. Hence, it was shown that inquiry skills are perceived and practiced

differently in the two contexts (teachers engaged with an educational innovation within their school vs student-teachers conducting a thesis as part of their online master studies) and most probably this will apply to other contexts as well. Therefore, the context should be taken into account when designing a research related to the teacher-inquirer identity.

8.10. Future Research

This thesis investigated both novel and long-standing concepts opening new avenues for research. The following paragraphs highlight some areas for future research.

First of all, scholars and educators can find in this thesis a holistic definition of teacher identity that can be utilized in studies that come from the field of education, psychology, and social science. In contrast to the current situation regarding research in teacher identity, the definition of teacher identity provided in this thesis is based on sound theories of self and identity. Although the definition is adequately elaborated, it would benefit from a clearer specification of the components that comprise the teacher identity.

Concerning identity components, in this thesis, the inquiry skills of the teacher-inquirer identity were identified and examined in two settings. The results generated several questions regarding the skills that teachers and student-teachers practice during an inquiry. For instance, why exploring skills were practiced less than other skills during inquiry? Why teachers only limitedly practiced writing and presenting skills? To what extent designing, implementing, evaluating, and reflecting skills are perceived as interrelated? In what ways emotions affect the practice of inquiry skills? These and other questions can be best examined through qualitative or mixed methods research.

In addition, future research could examine the applicability of the theoretical model regarding inquiry skills in different settings. For instance, it could target student-teachers who are doing their practicum, teacher leaders, teachers of a specific discipline, etc.

From another standpoint, in this thesis, it was examined how perceptions of ownership, sense-making, and agency were related to the practice of inquiry skills. Future research could examine topics related to, for instance, ways for cultivating perceptions of ownership, supporting teachers in making sense of the inquiry, and methods for achieving agency. Moreover, it could be investigated how changes in these perceptions affect the practice of inquiry skills.

Similarly, this thesis examined how emotions are related to the practice of inquiry skills. A qualitative study on how emotions affect the practice of inquiry skills as well as other components of the teacher-inquirer identity would be invaluable towards acquiring a better understanding of the role of emotions.

Lastly, in this thesis, it was found that several skills, including information literacy skills and English language skills, as well as previous experience in conducting inquiry are minimally or not at all related with the practice of inquiry skills. These results are conspicuous and further research can examine in greater depth their validity.

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Appendix A

Publications

Konstantinidis, A., & Badia, A. (2020). Differences among teachers in the development of the teacher-inquirer identity. In G. París, C. Quesada-Pallarès, A. Ciraso-Calí, & H. Roig-Ester (Eds.), *Book of Abstracts EARLI SIG14 2020* (p. 42). EARLI SIG14 and UAB.

https://ddd.uab.cat/pub/l1ibres/2020/225731/abstractsSIG14_a2020.pdf

Konstantinidis, A., & Badia, A. (2020). In-service teachers' inquiry skills during an educational innovation: Examination of the relationships. In G. París, C. Quesada-Pallarès, A. Ciraso-Calí, & H. Roig-Ester (Eds.), *Book of Abstracts EARLI SIG14 2020* (p. 41). EARLI SIG14 and UAB.

https://ddd.uab.cat/pub/l1ibres/2020/225731/abstractsSIG14_a2020.pdf

Konstantinidis, A., & Badia, A. (2020). The Student-Inquirer Identity During the Master Thesis in an Online University. Proceedings of the EDEN 2020 Virtual Conference. Timisoara, Romania.

Konstantinidis, A., & Badia, A. (2019). Inquirer Teacher Identity During an Educational Innovation. *ICERI2019*, 5126–5134.

Appendix B

Survey on Teachers' Perspectives Regarding Inquiry (English version)

Gender

Female, Male, I do not want to reply, Other

Age

21-30, 31-40, 41-50, Over 50

What is your specialisation?

Pre-school (3-5 years old), Primary education (6-12 years old), Special education, Instructor specialist (e.g. foreign language, mathematics, languages, music), Other

What is the type of school you are currently working?

Pre-School (3-5 years old), Primary school (6-12 years old), Secondary/High/Vocational School (13-18 years old), Other

How many years of teaching experience do you have?**What is your English language level?**

No experience, Elementary, Intermediate, Advanced, Proficient

What is your level at: (Very low, Low, Moderate, High, Very high)

Knowing about and understanding computer use (e.g. knowing that computer memory is important for running programs, knowing how to install/uninstall a program)

Accessing and evaluating information on the web (e.g. selecting information from a website that is relevant to a particular topic, implementing strategies to verify the veracity of information)

Managing information (e.g. creating a file structure in a directory, sorting or filtering information)

Transforming information (e.g. creating a chart to represent a table of data, creating a diagram to supplement text in a document)

Presenting information (e.g. creating a presentation about an educational topic, creating a photo collage or adding text to a photo)

Sharing information (e.g. selecting the most appropriate communication platform for a specific communicative purpose: uploading a video on youtube, attaching a document to an email)

Using information safely and securely (e.g. using strong passwords, knowing ways to protect private information)

To what extent have you participated in the following professional development opportunities during the last 3 years (Not at all, To a small extent, To some extent, To a moderate extent, To a great extent)

Courses and workshops

Education conferences

Observation visits to other schools

Professional development networks

Individual and collaborative research

Mentoring and peer observation

Pedagogical/School projects (e.g. eTwinning, T4E)

Please describe briefly the pedagogical project in which you took part during the last 3 years (in case you took part in several projects, describe the one you consider more successful) reporting some of the activities and the most significant outcomes

What was the duration of the project?

Consider your experience in developing that educational project and answer the following statements as accurately and honestly as possible reporting the extent to which they are true.

(Not at all, To a small extent, To some extent, To a moderate extent, To a great extent)

I shared my experience with others (e.g. colleagues)

I have the intention to share my experience with others

This project was important for me

This project was in accordance to my teaching practices (or suitable to me as a teacher)

The project was meaningful for me

I could relate knowledge derived from the project to my own preexisting knowledge

I learned by doing the project

I have developed similar pedagogical projects in the past

I acquired discipline knowledge by doing the project

Overall, I had an active role in the realization of this project

It was my own choice to develop this project

I had control of the decisions related to the project

The successes of the project are more due to my choices rather to external factors

The failures of the project are more due to my choices rather to external factors

The project helped me to understand that teaching should aim towards the acquisition of higher order thinking skills

The project helped me to understand that I should improve my teaching methods

The project helped me to understand that I should utilize more student-centered teaching practices

The project helped me to understand that I should utilize traditional teaching practices (i.e. lecturing) less

The project helped me to understand that I should enrich my teaching practice with new technological tools

The project helped me to understand that I should adapt my teaching practices to societal needs

The project helped me to understand that I should overcome challenges in order to improve my students' learning

The project helped me to understand that I have to manage the increased workload

The project helped me to understand that I have to find a balance between the increased workload and personal life

The project helped me to understand that I have to increase my knowledge in the disciplinary domain

The project helped me to understand that I have to increase my knowledge in new teaching methods that are relevant to the disciplinary domain

The project helped me to understand that I have to acquire more teaching experience in the disciplinary domain

The project helped me to understand that I have to prepare more in order to teach the subject matter

I tried to reconcile the needs of the project with the needs of the school syllabus

I tried to integrate the project activities in the daily class

I encouraged my students to focus on the process rather than on the product

I shared my thoughts and feelings with my students as regards the development of the project

Due to the project I tried to utilize more activities where students learn from experience

Due to the project I tried to utilize more activities where students' collaboration is needed

Due to the project I tried to utilize more activities where students are active in the class

Due to the project I tried to utilize more activities where students self-manage their learning

Due to the project I tried to utilize technological tools in my teaching more often

Due to the project I tried to utilize more technological tools in my teaching

Due to the project technological tools have become more integrated in the learning process

Due to the project I encouraged students to use technological tools in their assignments

The project helped me to interact more meaningfully with my students

The project helped me to motivate my students

The project helped me to collaborate with other teachers

The project helped me to become more responsive to students' needs

Colleagues supported me (i.e. with pedagogical advice)

The school director supported me (i.e. by reducing my workload)

The school staff supported me in the technical aspects of the project

Parents encouraged me for doing the project

Students encouraged me for doing the project

Report as accurately and honestly as possible the extent to which you have developed each of the following activities during the pedagogical project (Not at all, To a small extent, To some extent, To a moderate extent, To a great extent)

Checking whether students are able to reflect on their learning

Checking whether students are able to set specific personal learning goals

Checking whether students demonstrate the kinds of social and collaborative skills needed for teamwork and citizenship

Checking whether students are able to monitor and manage their own emotions

Checking whether prior knowledge and cultural backgrounds that students bring to the setting are valued and utilized

Checking whether students could see and understand the connections across content areas

Reviewing information regarding problems in students' learning to identify an area for concentrated action

Collecting further information to ensure accurate understanding of a particular problem in students' learning

Identifying challenges in addressing a particular problem in students' learning

Recognizing strengths and opportunities to build upon for addressing a particular problem in students' learning

Searching for literature related to a particular problem in students' learning

Evaluating literature found for quality and relevance with a particular problem in students' learning

Reading literature to increase knowledge about a particular problem in students' learning

Recording and organizing the information related to a particular problem in students' learning

Discussing with other teachers at school about a particular problem in students' learning

Asking about ways to address a particular problem in students' learning on educational websites/social media

Asking more knowledgeable others (e.g. academics, mentors) about ways to address a particular problem in students' learning

Attending educational conferences/meetings/seminars/courses related to a particular problem in students' learning

Asking about ways to address a particular problem in students' learning in professional meetings with other teachers

Generating ideas on how to address a particular problem in students' learning and considering the feasibility of each one

Creating lesson plans that focus on addressing a particular problem in students' learning and checking their quality and relevance to the particular problem

Designing assessment methods and checking their quality and relevance to a particular problem in students' learning

Designing the data collection methods for evaluation of the lesson plans

Implementing lesson plans that address a particular problem in students' learning

Collecting data (e.g. through the learning assignments) during and/or after the implementation of the lesson plans

Monitoring students' understanding and learning

Observing students' learning behaviours

Evaluating the design of lesson plans

Evaluating the design of the assessment methods of the lesson plans

Evaluating the implementation of the lesson plans

Analysing collected data and evaluating the extent to which the particular problem in students' learning has been addressed

Reflecting on the design of the lesson plans to learn from the experience

Reflecting on the design of the assessment methods to learn from the experience

Reflecting on the implementation of the lesson plans to learn from the experience

Reflecting on the outcomes of the intervention to learn from the experience

I wrote a text about the process of addressing the particular problem in students' learning and I published it on social media/personal blog/website

I wrote an article about the process of addressing the particular problem in students' learning for publishing in an academic journal

I wrote a text about the process of addressing the particular problem in students' learning for publishing on local media (e.g. newspapers)

I wrote a text about the process of addressing the particular problem in students' learning for publishing on educational websites

I presented the process of addressing the particular problem in students' learning in an academic conference/symposium

I presented the process of addressing the particular problem in students' learning in an interactive workshop

I presented the process of addressing the particular problem in students' learning in a meeting within the school

I presented the process of addressing the particular problem in students' learning in a professional meeting with other teachers (outside of the school)

Appendix C

Survey on Student-teachers' Perspectives Regarding Inquiry (English version)

Gender

Female, Male, Other

Age

21-30, 31-40, 41-50, Over 50

What is your highest academic degree?

Diploma, Bachelor, Master, PhD, Other

What is your current job?

Nursery teacher (0-3 years old), Kindergarten teacher (3-5 years old), Primary school teacher (6-12 years old), Special Education teacher, Specialist teacher (Music, Physical education, etc.), Secondary school teacher (Maths, Languages, Sciences, etc.), Psycho-pedagogical orientation (in an educational centre, in a psycho-pedagogical group, etc.), In an organisation not relevant with education, I am not working currently, Other

How many years of working experience do you have?

What is your English language level?

Very low (I do not understand texts in English), Elementary (I can understand few things when I read), Intermediate (I can sufficiently understand or understand a lot when I read), Advanced (I can write in English with some errors), Very high (I read and write in English almost without any error)

What is your previous experience on doing some activity similar to those carried out in a TFM (for example, look for documents of theoretical content, etc)

No previous experience, Some previous experience doing a specific task of a TFM, Sufficient previous experience doing tasks of a TFM, I have done a TFG previously, I have done another TFM previously

TFM type

Research (empirical work, collecting and analyzing data), Research (An educational or psychoeducational intervention has been carried out and data has been collected for research

purposes), Professionalization (An educational or psychoeducational intervention has been carried out and evaluated), Other

What is your level at: (Very low, Low, Moderate, High, Very high)

Using specific computer programmes (i.e. text processing or spreadsheet)

Accessing and evaluating the information on the web (e.g. selecting information from a website and verifying the veracity of information)

Managing information (e.g. creating a file structure in a directory, sorting or filtering information)

Transforming information (e.g. creating a chart to represent a table of data, creating a diagram to supplement text in a document)

Presenting information (e.g. creating a presentation about an educational topic, creating a photo collage or adding text to a photo)

Sharing information (e.g. selecting the most appropriate communication platform for a specific communicative purpose: uploading a video on youtube, attaching a document to an email)

Using information safely and securely (e.g. using strong passwords, knowing ways to protect private information)

Finding a topic (e.g. finding a good research problem, formulating research questions)

Building your knowledge about a topic (e.g. finding and reading research articles)

Planning a research project (e.g. selecting an appropriate research design, considering ethical issues)

Collecting data (e.g. selecting and implementing appropriate data collection methods – questionnaire, interview, etc.)

Analysing data (e.g. using data analysis software, conducting data analysis)

Writing an academic article (e.g. interpreting the results of the research and communicate them)

Knowing the professional context as well as its tasks and problems

Finding information to focus on a problem related to a professional context

Developing your professional knowledge and understanding of a problem of practice

Designing and implementing a practical intervention to address a problem

Evaluating the practical intervention and reflecting on the outcomes

Report as accurately and honestly as possible the extent to which you have developed each of the following activities during your TFM (Not at all, To a small extent, To some extent, To a moderate extent, To a great extent)

Listing relevant topics and interests to your profession or listing topics that you would like to research

Asking the opinion of others (e.g. tutors, colleagues, peers, friends) about your initial ideas

Browsing literature related to your field and/or your interests

Browsing websites related to your field and/or your interests

Reducing the list of topics to a choice of 2-3 topics

Identifying the purpose of your TFM

Formulating research questions or professional intervention questions about the chosen topic

Evaluating the viability of the TFM on the chosen topic

Conducting an organized search to find key literature related to the topic

Evaluating literature found for quality and relevance with the topic

Reading literature to increase your knowledge on the topic

Recording and organizing the information related to the topic

Discussing with your colleagues about the topic (e.g. with your classmates)

Posting questions about the topic on websites/social media

Asking more knowledgeable others (e.g. academics, mentors/professional people) about the topic

Attending face-to-face or online learning events (e.g. conferences/seminars/courses) to learn about the topic

Specifying in an operational way the research aims or the aims of the professional intervention

Considering the ethical issues

Selecting the research methodology or the methodology of the professional intervention

Designing and/or selecting the data collection methods and instruments

Utilizing the data analysis methods

Writing the theoretical part of the TFM

Planning the fieldwork (e.g. scheduling interviews, conducting a pilot or an intervention, selecting participants)

Collecting data of the research or of the professional intervention

Analysing collected data

Presenting the results of the TFM in different ways (e.g. tables, graphs)

Interpreting and discussing the results

Evaluating the results and reaching conclusions

Evaluating the extent to which the TFM has achieved its initial purpose

Reflecting on the adequacy of the design of the research methodology or professional intervention methodology

Reflecting on the implementation of the research project or professional intervention project

Reflecting on the relevance of the results of the research project or professional intervention project

Structuring the TFM according to the guidelines

Writing all the required parts of the TFM

Using a citation style throughout the TFM and verifying that the reference list is correct

Sending the TFM document before submission to others (e.g. peers, friends) and asking for feedback

Self-evaluating the TFM before submission (e.g. revising and proofreading)

Developing a specific document (e.g. a PowerPoint) to present the TFM

Rehearsing and revising the presentation

Presenting and recording the presentation of the TFM

Answering board's questions about the presentation

Reflecting on the process of presenting the TFM to the board

Report as accurately and honestly as possible how frequently you have experienced each of the following feelings while carrying out your TFM (never, few times, sometimes, often, very often)

Enjoyment, Enthusiasm, Pride, Hope, Admiration, Pleasure, Satisfaction, Gratitude, Belonging,

Relief, Disappointment, Anxiety, Boredom, Anger, Distrust, Shame, Sadness, Exhaustion,

Loneliness, Frustration, Fear

Indicate the degree of your agreement or disagreement with each of the following statements related to your perception about some aspects of the TFM (strongly disagree, disagree, neutral, agree, strongly agree)

I am proud of my TFM

My TFM is important to me

I invested a lot of energy and time in my TFM

I shared (or I have the intention to share) my TFM with others (e.g. colleagues)

I have the intention to continue in the future the work initially developed in the TFM

It makes sense to me that all students of a master's degree program have the obligation to develop a TFM

Overall, TFM learning activities made sense to me

The TFM requirements were congruent with my perception on how I should learn as a postgraduate student

I established significant links between my previous knowledge and knowledge that I acquired through the TFM

I can identify several competences I developed in the TFM that would be useful in my current or future profession

I have been able to decide (without any inference from anyone) the theme of my TFM

In general, it was me who took the main decisions regarding the development of the TFM

I had the opportunity to develop the design part of my TFM (research or professional) as I originally planned

I was able to develop the practical aspects of the TFM as I initially had in mind

The successes and failures of the TFM were more due to my choices instead of external factors

I was able to organize the best conditions for me (family, work, time availability, etc.) to develop my TFM correctly

Most of the time I had high active participation in the development of my TFM

Most of the time I had to accommodate to the suggestions of the UOC professor instead of developing my ideas

I performed the minimum activities required for the TFM

I devoted more time and energy than what was actually required to develop the TFM

The requirements of the TFM fit well with the way I currently act as a student

I have tried to improve my learning skills to adequately respond to the requirements of the TFM

After having completed my TFM I feel that I have become a better student to do a professional intervention

I feel more comfortable doing typical master's courses than having to develop a TFM

The TFM has significantly changed the way that I view myself as a student

For the phrase “I increased my knowledge on...” report as accurately and honestly as possible the extent to which each of the following statements is correct (strongly disagree, disagree, neutral, agree, strongly agree)

how to read academic papers

how to write the theoretical part of the TFM

how to design a research or a professional intervention

how to collect and analyse data

how to present and discuss the results

how to reach to conclusions based on the results

how to write an academic text (e.g. an article or a report)

conceptual (theoretical) aspects related to the topic of the TFM

procedural aspects related to the research processes

procedural aspects related to the professional intervention

information about the social context of the research or the professional intervention

how to make decisions about how to do a research or professional intervention

myself, who I am and I act as a student

Learn about developing inquiring-related processes

Problems existing in social reality (e.g., in an educational institution, in a professional collective, etc.)

how to search for possible solutions in a real problem

how to design solutions to a real problem

how to implement solutions to a real problem

how to reflect on the implemented solution of a real problem

Indicate the degree of your agreement or disagreement with each of the following statements related to the people who have participated in the development of your TFM, either because they have helped you (e.g., professors of the UOC) or because they have been affected by the research or the professional intervention (e.g., teachers, students or other groups) (strongly disagree, disagree, neutral, agree, strongly agree)

The UOC professor has given me enough feedback on my progress throughout the TFM

The UOC professor has given me enough emotional support

The UOC professor has given me enough learning orientations to guide the work of the TFM

My classmates have given me enough social and emotional support

The UOC has given me access to enough content material of my TFM

The UOC people have provided me with access to useful technology to develop the TFM

The people affected by the practical part of my TFM have participated with sufficient motivation

The affected people have collaborated with me in the design of the research or professional intervention

The affected people have helped me to implement the research or the professional intervention

The affected people have provided me with most of the information that I have needed in the practical part of my TFM

The affected people have helped me solve the problems that have appeared in the practical part of my TFM