EXPLORING TEACHERS' CONSTRUCTIVIST BELIEFS USING TALIS 2013: APPROACHES TO TRAINING AND DEVELOPMENT

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The changing landscape of demographics, technology, and diversity in the learning environment is challenging schools around the world to rethink their approaches to the implementation of high-quality teaching practices. Classroom practices are becoming more complex because educators have to ensure that their students are well-equipped with 21st century skills (e.g., Darling-Hammond, 2010; Dede, 2010; Griffin, McGaw, & Care, 2012). Educators, curriculum developers, and school administrators need to be more than experts in pedagogy. They are now required to keep up with current ideas, innovative instructional practices, and the results of a variety of educational reform efforts. Believing that teachers' beliefs are the most important psychological construct with regard to instructional practices (Pajares, 1992) and that teachers' beliefs are related to their choice of classroom practices and, ultimately, the students' performance (Bybee, Taylor, Gardner, Van Scotter, Powell, Westbrook, & Landes, 2006; Staub & Stern, 2002), the author of this study utilizes the international data set of the Teaching and Learning International Study (TALIS) 2013 to examine the associations between teachers' constructivist beliefs, their self-efficacy beliefs, professional activities, and the school principals' instructional leadership as related to lower secondary school teachers and principals in South Korea, Finland, and Mexico. These three countries represent the high and low performers in the global index of cognitive skills and educational attainment (Pearson, 2014). An account of their educational practices will provide some insights for stakeholders in school systems across nations. Nevertheless, it is important to understand that each country has unique teaching and learning conditions, and that conclusions reached in relation to such conditions do not apply

across nations. A series of hierarchical linear modeling (HLM) studies were performed for the present work to provide evidence-based information with practical implications to school administrators and educational policymakers regarding the development and implementation of leadership programs and teacher professional development. Additionally, an understanding of how the constructivist beliefs associate with the level of self-efficacy and professional activities will assist curriculum developers in higher educational institutions in the development of quality teacher preparation programs for the future teaching workforce.

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CHAPTER 1

Introduction

Recently, educational researchers have speculated on what future education in elementary schools will look like and have questioned how well elementary school teachers are prepared to deal with new teaching ideas and practices and with the diverse needs of today's learners. To illustrate, there are significant opportunities and challenges for elementary school teachers who are teaching in the STEM (Science, Technology, Engineering, and Mathematics) content area (Abrams, Southerland, & Silva, 2007). The STEM content area, as opposed to the common curriculum organization with separate subjects, implies an integrated curriculum design which focuses on activity-based learning. There have been concerns regarding how to effectively integrate such applicative subjects into existing school programing (Herschbach, 2011). The complexity of teaching in this context has given the issue of teachers' beliefs and practices an increasing importance and urgency.

Believing that teachers profoundly influence student learning and that improving teaching capabilities can lead to more effective learning and to a more effective educational system as a whole, the Organization for Economic Co-operation and Development (OECD) initiated the largest international survey of teachers, named the "Teaching and Learning International Survey" (TALIS). Begun in 2008, TALIS collected information from teachers and school principals about their feelings, beliefs, and pedagogical and professional practices, and about their classroom and school characteristics. Researchers believed that this information could help in the shaping of effective teaching practices and policies (OECD, 2014). Above all, the cross-national data set allowed researchers to conduct cross-national and educational system analyses, which will provide the participating countries with the opportunity to see differences or similarities in terms of challenges and teaching approaches that may impact the teaching and learning environment in schools (Jensen, Sandoval-Hernández, Knoll, & Gonzalez, 2012).

Numerous researchers have utilized international large-scale databases which contain nationally representative samples of students, such as those related to the Program for International Student Assessment (PISA), the Progress in International Reading Literacy Study (PIRLS), and the Trends in International Mathematics and Science Study (TIMSS), to investigate student achievements, teacher practices, and school policy. Over one hundred papers have been published and have proved to be of value for educators and policymakers alike. The latest international large-scale database which contains a nationally representative sample of teachers, TALIS 2013, was released for public use on June 25, 2014. To date, a small number of studies have been published using the 2013 TALIS data set. It is essential to use the most updated data to identify the educational phenomena associated with teachers' instructional beliefs and practices.

A Brief Introduction to TALIS 2013

The Teacher and Learning International Survey (TALIS) 2013 was the second and most recent international survey of teachers and principals in the lower secondary schools. The complete data collection included more than 6,600 schools and 107,000 teachers from 34 countries and sub-national entities. The participating jurisdictions included Abu Dhabi (United Arab Emirates), Alberta (Canada), Australia, Flanders (Belgium), Brazil, Bulgaria, Chile, Croatia, Cyprus, the Czech Republic, Denmark, England (the United Kingdom), Estonia, Finland, France, Iceland, Israel, Italy, Japan, the Republic of Korea, Latvia, Malaysia, Mexico, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Singapore, the Slovak Republic, Spain, Sweden, and the United States (OECD, 2014). Table 1.1 presents the teacher and school samples for each of the 34 countries. The teacher and school samples ranged from 1,867 teachers and 98 schools in Cyprus to 14,291 teachers and 1,070 schools in Brazil. It is important to note that 1) data from United States were not included in the calculations for the international average because they did not meet the international standards for participation rate, which required at least 75% participation in the survey from the schools and the teachers; and 2) the data from Iceland were not available for public use; research can obtain the data directly from the country (OECD, 2014).

To obtain nationally representative samples of teachers and schools, TALIS 2013 employed two-stage stratified cluster sampling. In the first stage, TALIS selected 200 lower secondary schools per country determined by probability-proportional-to-size (PPS) technique. Then TALIS randomly recruited at least 20 teachers and one school leader from each school using software from the IEA Data Processing and Research Center (DPC). As a result, the nominal international sample was a minimum of 4,000 teachers. There were two sets of questionnaires, one for teachers and another for the school leaders. School principals and teachers filled in the self-report questionnaires on paper or on-line. The questionnaire designed for teachers collected information regarding teachers' demographics, qualifications, employment characteristics, professional development participation, classroom practices, beliefs, and attitudes. The questionnaire for school principals collected information about principals' demographics, employment characteristics, school characteristics, and management and leadership.

Table 1.1

TALIS 2013 - Participation (OECD, 2014)

	Number of participating schools	Responding teachers in participating schools	Overall Participation (%)
Australia	123	2059	70
Brazil	1070	14291	91
Bulgaria	197	2975	96
Chile	178	1676	85
Croatia	199	3675	95
Cyprus	98	1867	95
Czech Republic	220	3219	98
Denmark	148	1649	62
Estonia	197	3129	99
Finland	146	2739	90
France	204	3002	61
Iceland	129	1430	76
Israel	195	3403	85
Italy	194	3337	88
Japan	192	3484	95
Korea	177	2933	78
Latvia	116	2126	77
Malaysia	150	2984	73
Mexico	187	3138	87
Netherlands	127	1912	61
Norway	145	2981	58
Poland	195	3858	97
Portugal	185	3628	86
Romania	197	3286	98
Serbia	191	3857	92
Singapore	159	3109	99
Slovak Republic	193	3493	95
Spain	192	3339	88
Sweden	186	3319	84

Sub-national entities			
Abu Dhabi (UAE)	166	2433	74
Alberta (Canada)	182	1773	87
England (UK)	154	2496	63
Flanders (Belgium)	168	3129	75
United States	122	1926	51

It is crucial to note that in order to provide policy-relevant data, the TALIS consortium invited all OECD countries, whether they had participated in TALIS 2008 or not, to take part in a rating exercise that would provide the TALIS consortium with insight into the high priority issue of instructional practices and beliefs. Twenty-five countries participated. The purpose of this rating exercise was to guide the content of TALIS 2013. The results were intended to help the consortium develop a more focused survey of countries' policy priorities. Table 1.2 presents the top ten themes derived from the priority ratings (OECD, 2014).

Table 1.2

Top Ten Themes from Priority-Rating for TALIS 2013 (OECD, 2014)

Ranking	Theme
1	School leadership
2	Teachers' instructional practices and beliefs
3	Profile of teachers' in-service education and training
4	School climate and ethos
5	Initial teacher education
6	Satisfaction and effectiveness of in-service education and training
7	Recognition, reward, and evaluation of teachers
8	Teachers' professional practices
9	Motivations and early career experience of teachers
10	Attracting good students into teaching

The cross-national study was critical because it provided valuable information to administrators and educators concerning educational systems, school programming, classroom practices, and school characteristics across different countries (e.g., Kyriakides, 2006; Valverde & Schmidt, 2000). Researchers could then further investigate the relationship between teachers' beliefs, practices, and other factors at various levels as they related to other aspects of the educational system. In the global context, participating countries would learn a great deal about teaching conditions around the world. This information would provide them with the opportunity to learn from others in order to enhance their teaching, teacher preparation, and development, and to launch educational reform efforts (Hammerness, 2013; Szilagyi & Szecsi, 2011). Further, in the local context, education policymakers and school administrators will be provided with suggestions on how to adjust educational practices and local policies.

Constructivism in Learning & Teaching

The term constructivism has been used and mentioned in many disciplines. Its meaning varies according to one's perspective and position (Jones & Brader-Araje, 2002). Even within the field of education, there are variations on the theme of constructivism. The concept has emerged from the work of several theorists, including Jean Piaget (1967) as cognitive constructivism, and Lev Vygotsky (1978) as social constructivism.

According to Piaget's notion of cognitive constructivism, which is an individual-focused concept, learners construct their knowledge through assimilation and accommodation (Liaw, 2004). By contrast, in the social constructivism concept of Vygotsky, which focuses more on the role of the social context, learners construct their knowledge through interaction with others (Liaw, 2004; Mackinnon, 2004). Numerous constructivist learning theorists have discussed constructivism as a learner-centered learning theory – involving an active process in which learners actively develop their own meaning or concept of things by asking questions, interacting with society, and interpreting the environment based upon their existing knowledge or experiences (Prawat, 1996; Thayer-Bacon, 2000; Windschitl, 1999a; Woolfolk, 2010).

As noted by Brooks and Brooks (1999), a constructivism-based approach, as a type of inquiry-based learning, requires learners to be active and curious, interacting with peers and instructors for information and utilizing multiple sources of information. The creation of new knowledge in constructivism, as opposed to behaviorism, is an individual process which cannot be accomplished by the transferal of information or habits from a teacher to the students. In constructivism, the teacher becomes a facilitator who supports students in collaborative learning.

A number of studies on science education have emphasized the importance of the constructivism concept which centers on learning with understanding (Cakir, 2008; Singer & Moscovici 2008; Taber, 2014; Witteck, Beck, Most, Kienast, & Eilks, 2014), and a range of studies have supported the transition from the traditional framework, such as the teacher-directed approach (e.g., textbook reading, lecture, limited discussion) to a more constructivist-oriented instruction in order to help foster the skills of critical thinking, problem solving, independent study, and decision making among learners (e.g., Barak & Shakhman, 2007; Ford, 2010; Nadelson et al., 2013). Likewise, Windschitl (1999b) stated that

> . . . such experiences include problem-based learning, inquiry activities, dialogues with peers and teachers that encourage making sense of the subject matter, exposure to multiple sources of information, and opportunities for students to demonstrate their understanding in diverse ways. (p. 752)

Merrill (1991) listed five assumptions made by constructivism. First, learners construct knowledge based on their previous experience. Second, learning is a learner's personal interpretation of the world. Third, learning, as an active process, requires learners to develop meaning based on their experience. Fourth, collaborative learning and interacting by sharing perspectives will help learners re-evaluate their internal representation, leading to conceptual growth. Last, assessments should be incorporated into tasks, rather than becoming a separate activity.

As the constructivist approach has demonstrated significant improvement in students' learning performance, the constructivist instructional practices have become more dominant in public schools and teacher education programs (Bybee et al., 2006; Davis & Sumara, 2002; Fang & Ashley, 2004; Gordon & O'Brien, 2007; Marlowe & Page, 2005). Constructivism is now considered as one of the most significant learning theories in modern education (Hartle, Baviskar, & Smith, 2012).

The central idea of constructivist instruction is that the learning and new knowledge are constructed by the learners themselves through the use of their own previous knowledge. What, then, is the role of the teachers in the constructivist approach?

The teachers in the constructivist approach should take the role of facilitators who help students find and generate conclusions that are valid and unique to the students themselves (Richardson, 2003). Richardson (2003) explained that the teacher should check whether the students have previous knowledge related to the topics by asking them questions. Then, the teacher will assist the students in exploratory activities by interacting with the students and let them investigate the activities, construct and re-construct the information, and develop conclusions that are sound and unique to each student. Likewise, Garbett (2011) stated that

> Constructivism posits that the teacher's role is to help their students to actively construct new understanding for themselves. Diagnosis of students'

> prior understanding followed by carefully planned teaching sequences enables learners to grasp hitherto unknown concepts. Assessing whether they can then apply their new knowledge in new contexts verifies whether or not they have learnt what the teacher has taught. (p. 36)

Despite a growing number of studies examining the influence of constructivist instruction approach on student achievement, there is still much yet unknown about the factors associated with the constructivist beliefs of the teachers and how other factors in the educational system affect each other.

Teachers' Self-Efficacy Beliefs

Bandura (1977) introduced the concept of "self-efficacy," which was grounded in the theoretical framework of social cognitive theory. Teacher self-efficacy was described as the degree to which an individual teacher believes in his or her own ability to plan, organize, and carry out particular activities in order to complete an assigned goal (Bandura, 1977; Bandura, 2006). A similar definition was provided by Protheroe (2008), who described teacher efficacy as a teacher's sense of confidence in him or herself to stimulate the learning of students.

According to Bandura's (1993) and Protheroe's (2008) studies, determinants of teacher self-efficacy include prior teaching experience, training and development, and school culture. On the other hand, teacher self-efficacy is a determinant of classroom behavior, teaching effort, aspiration level (Tschannen-Moran, Hoy, & Hoy, 1998), teachers' behavior, attitude, and ultimately the student learning performance (Bandura, 1993; Protheroe, 2008). Researchers have also reported other factors that are associated with self-efficacy, which are school climate, administrative support, sense of community, and decision-making structure (Tschannen-Moran, Hoy, & Hoy, 1998).

A number of studies have investigated whether there is a connection between science teachers' constructivist beliefs and their personal perceptions of efficacy. Appleton and Kindt (2002) reported that science teachers tend to revert to a more traditional teacher-directed instructional approach when they do not feel confident in the content of their science knowledge. On the other hand, teachers with a high sense of self-efficacy are more likely to experiment with new teaching practices or strategies to meet students' needs in the science classroom (Protheroe, 2008). Numerous researchers have reported a variety of behaviors that are more likely to be performed by teachers with high self-efficacy:

- Trying innovative instructional practices (Ghaith & Yaghi, 1997; Protheroe, 2008);
- Being effective in classroom management (Giallo & Little, 2003; Tschannen-Moran, Hoy, & Hoy, 1998);
- Participating in professional development (Bumen, 2009; Ross & Bruce, 2007);
- Taking part in professional learning activities (Thoonen, Sleegers, Oort, Peetsma, & Geijsel 2011; Geijsel, Sleegers, Stoel, & Kruger, 2009).

As the constructivist approach depends heavily on the teacher's ability to engage learners in knowledge construction and to manage the learning environment safely, teachers with insufficient subject matter knowledge and sense of confidence may find it difficult to foster learning with understanding, which is the central goal of constructivist instruction.

Teachers' Professional Activities

The term collaboration has been widely used in many fields. It has been defined in numerous ways. Schrage (1991) described collaboration as

> The process of shared creation: two or more individuals with complementary skills interacting to create a shared understanding that none had previously

possessed or could have come to on their own. Collaboration creates a shared meaning about a process, a product, or an event. (p. 40)

Co-operation and collaboration among teachers, as the essential element in professional practices, include the following activities: 1) exchanging of teaching materials, 2) developing curriculum and lesson plans, 3) discussing the progress of the students, and 4) collective learning activities (Ying, 2007; Goddard, Goddard & Tschannen-Moran, 2007).

While various factors have been considered in the ongoing studies of constructivist instruction, social constructivists in education have proposed collaboration as an innovative way of student learning and of teachers' planning and instruction (Fulton, 2003). Collaboration in the educational context was believed to "promote the most effective teaching possible for the greatest number of students" (Pugach & Johnson, 1995, p. 178). From the teaching perspective, Dewey (1963) explained that collaborators, such as teachers and school librarians, worked, shared responsibilities, and conceptualized together in order to integrate their expertise in meaningful experience aiming to help learners to reach their full potential. Haycock (1998) stated that professional collaboration increased the possibilities of new ways of teaching, which ultimately improved the process of content delivery. Similarly, Goddard, Goddard, and Tschannen-Moran (2007) stated teachers collaborated by sharing experience that can promote learning to improve their classroom instruction. Hence, the most important outcome of professional collaboration could be that it stimulates teachers to go beyond their experiences, take personal risks, and engage with other stakeholders in order to improve their instructional practices.

To measure the level of teacher co-operation, OECD included questions related to exchange, collaboration, and cooperation among teachers in TALIS 2013. Eight activities were listed and calculated to create three indices: 1) teacher co-operation, 2) exchange and coordination for teaching, and 3) professional collaboration. On average, the activities that teachers report doing the least are observing other teachers' classes and providing feedback, followed by teaching jointly as a team in the same class, engaging in joint activities across different classes and age groups, and taking part in collaborative professional learning groups, respectively.

It is interesting that teachers in South Korea and Japan are among those who report the lowest frequency ("never doing") activity as engaging in joint activities across different classes and age groups; however, they reported being more engaged in observing other teachers' classes and proving feedback than were teachers from other countries. According to the TALIS 2013 report, there was fewer than 10 percent of the participants in South Korea and Japan who reported that they never observed other classes and provided feedback. On the contrary, more than 70 percent of the participating teachers in Spain, Iceland, France, Brazil, Flanders (Belgium), Portugal, Finland, Croatia, and Italy reported that they never observed other teachers' classes and provided feedback.

Additionally, the mean self-efficacy score varies across quartiles of the exchange, cooperation, and collaboration variables. It is obvious that there is a clear association between these two variables. Teachers who were more engaged in professional collaboration reported higher levels of self-efficacy (OECD, 2014).

Principal Instructional Leadership

Flath (1989) defined instructional leadership as the influence of a principal on teaching and learning with a goal to promote student outcome. Instructional leaders emphasized high-quality teaching and the development of policies that would promote student achievement.

Principals engaged in a high level of instructional leadership were likely to initiate and support learning communities, provide teachers with instructional feedback, model effective instruction, and encourage the use of assessment (Blase & Blase, 2000).

Numerous studies have reported that school principal practices have a small to moderate impact on student achievements in both direct and indirect ways (Hallinger, 2005; Hendriks & Steen, 2012; Huber & Muijs, 2010; Leithwood, Harris, & Hopkins, 2008; Robinson, Lloyd, & Rowe, 2008). Despite an increasing number of studies supporting this statement, Huber and Muijs (2010) called for more research on the effect of school principal practices on student achievement. To be specific, the authors explained that there is still a discrepancy in knowledge regarding how principals' practices influence student outcomes and whether or not the influences are mediated by teacher practices, school conditions, or national characteristics.

There is empirical evidence that the instructional leadership has positive effect on teacher practices and student achievement (Blase & Blase, 1999; Leithwood, Louis, Anderson, & Wahlstrom, 2004; Seashore Louis, Dretzke, & Wahlstrom, 2010; Robinson, Lloyd, & Rowe, 2008). In a range of recent studies, researchers have concluded that school principals influenced their students' achievement through having an effect on teachers' behaviors, beliefs, and classroom practices (Hendriks & Steen, 2012; Leithwood et al., 2008). In the study of Robinson et al. (2008), the authors confirmed the impact of school principals on classroom instruction. The authors further stated that the influence of instructional leadership on student outcomes was three to four times larger than that of other leadership practices. To be specific, when the instructional leader focused on "promoting and participating in teacher learning and development," the positive correlation between instructional leadership and student outcome was reported to have at least twice the effect size of other practices (Robinson et al., 2009).

Haney, Lumpe, and Czerniak (2003) pointed out that implementation of constructivism in the classroom will be extremely difficult for teachers, if other stakeholders, such as school personnel and members of the community, do not believe in the constructivist approach. Differences and perspectives contrasting with constructivism theory and practices among teachers, parents, administrators, and members of the community might hinder the implementation of the constructivist teaching practices (Haney et al., 2003). Likewise, Beamer, Van Sickle, Harrison, and Temple (2008) stated that even enthusiastic teachers would find it difficult to implement any innovative approaches to instruction when there was a lack of administrative support.

Hallinger (1987) described three dimensions of instructional leadership: defining the school mission, managing the instructional program, and promoting the learning climate. Each dimension contains a specific function, and each function consists of a variety of behaviors and practices (See Figure 1.1).

Blasé and Blasé (2000) listed primary strategies that principals can perform that will eventually encourage reflective behavior on the part of teachers, which are utilizing a variety of teaching practices, responding to diversity among students, planning properly, and taking risk. The strategies are 1) providing suggestions and feedback to teachers, 2) modeling for effective instruction, 3) using inquiry and soliciting opinions for improvement, and 4) giving compliments to teachers. The strategies had a positive effect on teachers' motivation, satisfaction, self-esteem, efficacy, sense of security, and feelings of receiving support (Blase & Blase, 2000). According to Hallinger's study (2005), over 100 empirical studies on instructional leadership have provided a wealth of information regarding the determinants of instructional leadership (such as the principal's gender, training, and experience, etc.) and the effect of instructional leadership on the organization (including aspects such as the school mission, curriculum, and teacher engagement) and on student learning outcomes. Levacic (2005) examined the associations between instructional leadership, teacher self-efficacy, and teacher collaboration. Teddlie (2005) studied the relationship between instructional leadership and teachers' self- efficacy and professional development. And a recent study of Gumus, Bulut, and Bellibas (2013) investigated the association between instructional leadership and teacher collaboration in Turkish primary schools. Although the instructional leadership model of Hallinger (1985) was the most frequently studied model of school leadership over two decades (Hallinger, 2005), to date, only a small number of studies have examined the effect of leadership on teachers' beliefs and practices.

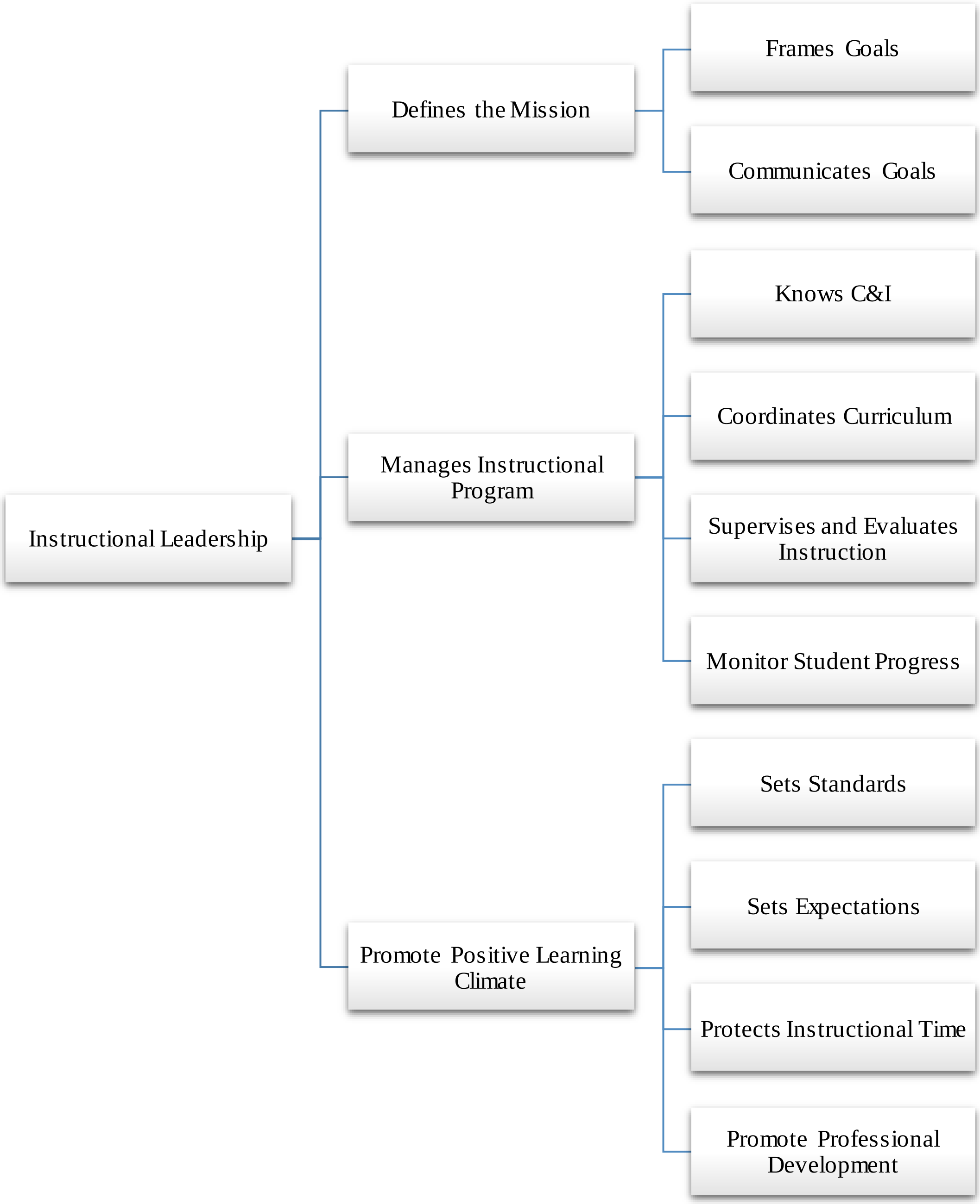

Figure 1.1. Instructional Leadership Framework (Hallinger, 1987; Hallinger & Murphy, 1985)

Significance of the Study

Pajares (1992) stated that teachers' belief about teaching is one of the most important psychological constructs. Through a clear understanding of such beliefs, researchers can present a clear picture of how the teachers' beliefs take part in the instructional practices (van de Schaaf, Stokking, & Verloop, 2008; Wilkins, 2008).

To provide evidence-based information which may help in strengthening instructional innovations in elementary school classroom teaching, this study utilized a cross-national data set, the Teaching and Learning International Study (TALIS) 2013, in determining the current level of constructivist beliefs among teachers and examining factors that associate with the constructivist belief. In this study, the author proposed three constructs, which were teachers' self-efficacy beliefs, teachers' professional activities, and principals' instructional leadership.

This study is significant because:

1. TALIS is the first international data set that provides rich information about teachers and principals. However, there is only a handful of studies that have utilized this data set. It is critical to analyze and learn about the educational phenomena from the most comprehensive and up-to-date data set available. Additionally, this study contributed to our understanding of the similarities and differences, in terms of teachers' and principals' practices and beliefs, across nations.
2. There is a gap in the body of knowledge regarding how the practices and beliefs of the stakeholders in the school system, such as a principals and teachers, influence teachers' or students' outcomes (Levacic, 2005; Teddlie, 2005), let alone any specific understanding of such influence with regard to a particular content subject area, such as science, mathematics, or technology. In the literature, Huber and Muijs (2010)

called for more extensive research on how such influence is mediated by other factors.

3. It contributed to our understanding of the principals' instructional leadership and its association with teachers' self-efficacy, teachers' professional activities, and innovative instructional beliefs. With greater understanding, school administrators and educational policymakers can make informed decisions regarding the development, the implementation, the funding, and the assessment of 1) school leadership programs and 2) teacher professional development.
4. Finally, an understanding of the current level of constructivist beliefs among in-service teachers and how these beliefs are associated with the level of self-efficacy can assist instructional designers and curriculum developers in higher education in the development of teacher preparation programs. This would ultimately ensure that pre-service teachers would be equipped with the skills and attitudes they need in order to be successful in their future careers.

Conceptual Framework

The conceptual framework has evolved from the review and integration of several theories and concepts that play significant roles in this study. Figure 1.2 presents a conceptual diagram for the analysis. The proposed constructs were separated by the levels of the analysis, which are teacher- and school-level. It is critical to note that although the dependent and independent variables are based on theoretical considerations and the arrows in the figure depict hypothesized directionality of the analysis, there will be no direction or impact established from analysis of this cross-sectional dataset.

First, the framework draws on constructivist theory (Prawat, 1996; Thayer-Bacon, 1999; Vygotsky, 1978; Windschitl, 1999a; Woolfolk, 2010). With relation to constructivist theory, the concern of this study was to explain the extent to which a teacher believes in constructivist-oriented instruction. Determining the factors that associate with such belief was a complicated matter, considering the complexity of the sampling design of TALIS dataset. A range of studies have reported factors that have a relationship with constructivist beliefs, such as teacher self-efficacy (Nie, Tan, & Liau, 2013), and administrative and community support (Beamer et al., 2008; Yore, Anderson, Shymansky, 2005). This study considered constructivist beliefs through a relationship framework of teacher self-efficacy, teachers' professional activities, and principals' instructional leadership.

Second, teacher self-efficacy, in the social cognitive theory of Bandura (1977), is defined as the degree to which an individual teacher believes in his or her own ability to plan, organize, and carry out particular activities in order to complete an assigned goal (Bandura, 1977; Bandura, 2006). The notion of self-efficacy is related to the role of teachers' efficacy in influencing the behavior of teachers when they have to manage challenging tasks. Teacher self-efficacy was shown to have a positive correlation with teaching practices (Vieluf, Kunter, & Vijver, 2013), attitudes toward implementing innovative teaching practices (Guskey, 1988), and constructivist instruction (Nie et al., 2013), and it was also proposed as a powerful predictor for classroom instructional practices (Smylie, 1988).

Third, the concept of teachers' professional activities was drawn from the studies of Goddard, Goddard, and Tschannen-Moran (2007) and Hattie (2009), which suggested that collaboration and co-ordination among teachers would encourage learning that would ultimately support changes in teachers' practices.

Fourth, the conceptual framework also draws on the instructional leadership model of Hallinger (1987) and on a study of Blase and Blase (2000) that indicated a positive association between instructional leadership and teachers' self-efficacy and reflective behaviors.

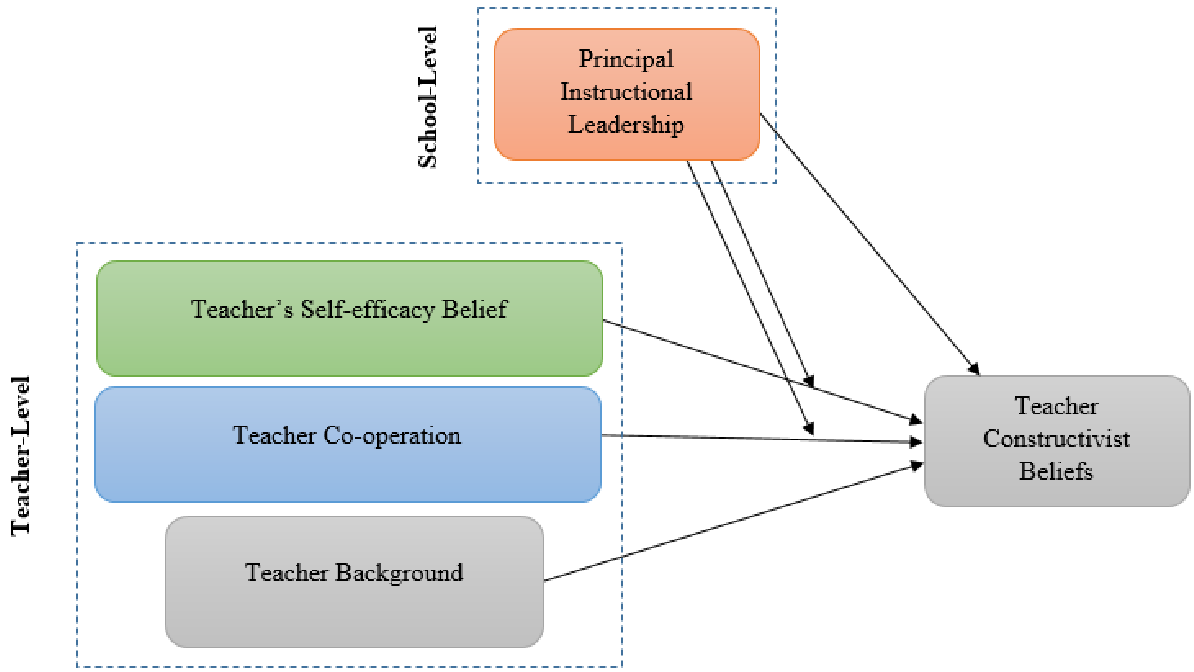

Figure 1.2. Conceptual Framework

Purpose of the Study

This study utilized a cross-national data set of the Teaching and Learning International Study (TALIS) 2013 to examine the relationships among teachers' constructivist beliefs, self-efficacy beliefs, professional activities, and the school principals' instructional leadership. A series of hierarchical linear modeling (HLM) studies was employed for analyzing the data, where teachers were nested within schools, in order to understand the variations among the elementary schools (if there is any) and to test whether principals' instructional leadership at the school level had a direct or moderating effect on teachers' beliefs and practices. Nevertheless, emphasis would be placed on the individual-level effects, or the teacher level. A series of HLM studies helped explain the similarities and differences in teachers' constructivist beliefs and relevant practices between selected countries (South Korea, Finland, and Mexico).

Research Questions

This quantitative study has been designed to examine the associations between teachers' constructivist beliefs, self-efficacy beliefs, professional activities, and school principals' instructional leadership. Previous studies have indicated the importance of constructivism in teaching practices and the inter-relationship among these variables. In this context, this study was guided by the following research questions:

1. What are the teachers' levels of constructivist instructional beliefs?
2. Do the constructivist beliefs vary across schools?
3. Does self-efficacy beliefs have a significant relationship with the constructivist beliefs of teachers across schools?
4. Does teachers' level of co-operation have a significant relationship with the constructivist beliefs of teachers across the schools?
5. Does the principals' instructional leadership have a significant relationship with the constructivist beliefs of teachers across schools?
6. Does the principals' instructional leadership moderate the relations between 1) teachers' self-efficacy beliefs and teachers' constructivist beliefs and 2) teacher's co-operation and teachers' constructivist beliefs across schools?
7. Do teacher backgrounds (e.g., years of working experience, class size, and percentage of time spent on actual teaching) have a significant relationship with the constructivist beliefs of teachers across schools?

Research Hypotheses

Figure 1.3 presents the proposed hypotheses for this study.

H1: Constructivism will vary among the schools.

H2: Principal instructional leadership will have a positive direct effect on teacher constructivist beliefs.

H3a: Teachers' self-efficacy will have a direct effect on teacher constructivist beliefs.

H3b: The effect of teachers' self-efficacy will vary among the schools.

H4a: Teacher co-operation will have a direct positive effect on teacher constructivist beliefs.

H4b: The effect of teacher co-operation will vary among schools.

H5a: Amount of experience will have a direct effect on teacher constructivist beliefs.

H5b: The effect of amount of experience will vary among schools.

H6a: Class size will have a direct effect on teacher constructivist beliefs.

H6b: The effect of class size will vary among schools.

H7a: Percentage of time teaching time will have a direct effect on teacher constructivist beliefs.

H7b: The effect of percentage of teaching time will vary among schools.

H8a: The relationship between self-efficacy and teacher constructivist beliefs will be moderated by principals' instructional leadership.

H8b: The relationship between teacher co-operation and teacher constructivist beliefs will be moderated by principals' instructional leadership.

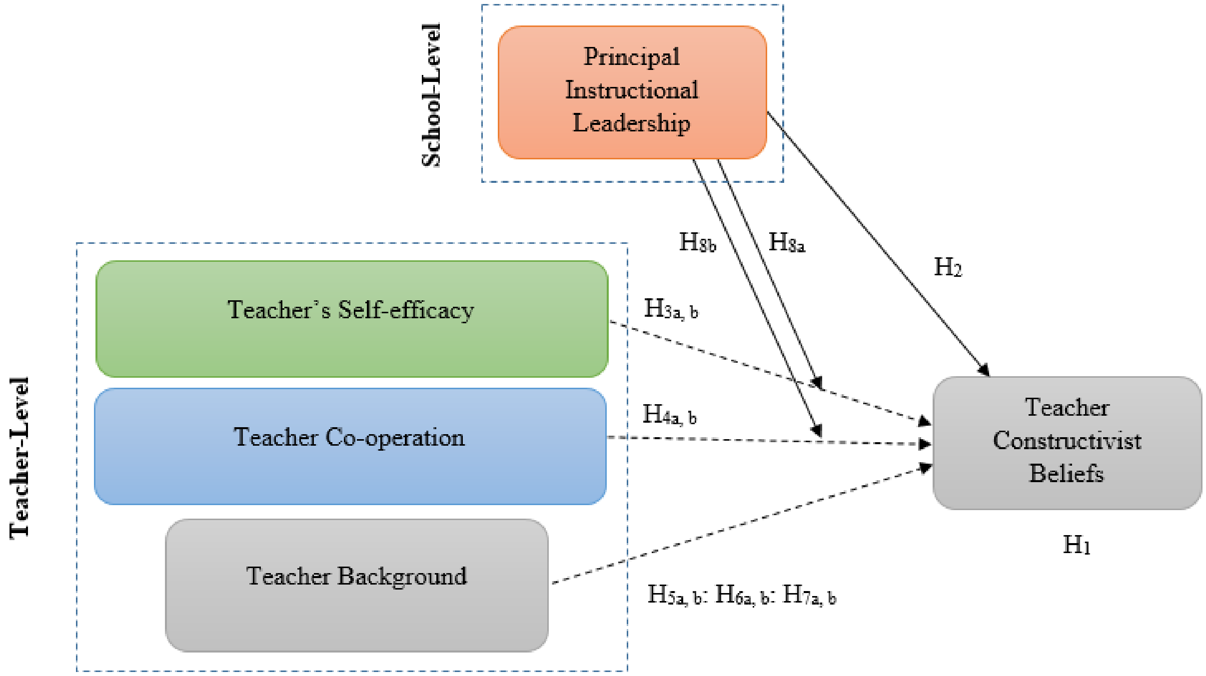

Figure 1.3. Proposed Research Hypotheses for the Study

Delimitations

1. The data set was cross-sectional data. Although the author selected the dependent and the independent variables based on the theoretical consideration, claims of causality would not be established in the analysis.
2. This study was delimited to the participants who reported teaching in the lower secondary schools in South Korea, Finland, and Mexico.
3. In South Korea, the data were collected after the TALIS reference year (OECD, 2014).

Limitations

1. The proposed conceptual framework consists of multiple psychological constructs, including constructivist beliefs, self-efficacy beliefs, and instructional leadership. The interpretation of these constructs may differ by country. Interpretation and comparison should be done with caution.

2. According to the TALIS 2013 technical notes, the TALIS data set was derived from teachers' and principals' self-reports. Although the perceptions and beliefs are important information, the self-reported data are subjective and could be affected by the respondents' biases.
3. This study utilized TALIS, a publicly available data set. A variety of factors and constructs that may have strong theoretical support from other studies may not be included in the TALIS data.

Definition of Terms

The following terms are used in this study:

Constructivist Belief: "Constructivist beliefs are characterized by a view of the teacher as the facilitator of learning with more autonomy given to students, whereas a direct transmission view sees the teacher as the instructor, providing information and demonstrating solutions." (OECD, 2014, p. 217)

Instructional leadership: This is the school principal's influence on teaching and learning. Instructional leadership consists of several practices including the management of the school's goals and curriculum, actions to improve classroom instruction, and the supervision of teachers, students, and instructional outcomes among many others (Robinson et al., 2008; Hallinger, 2005; Hallinger & Murphy, 1987).

ISCED: International standard classification of education. With this identification, levels of education across countries are comparable (ISCED 1997).

Lower Secondary Education (ISCED level 2): This is equivalent to middle school and junior high (grades 7 – 9) in the United States, middle school (grades 1-3) in South Korea, year 7-9 in Mexico, and grades 7-9 plus an optional 10th grade in Finland (OECD, 2014).

Collaboration: "The process of shared creation: two or more individuals with complementary skills interacting to create a shared understanding that none had previously possessed or could have come to on their own. Collaboration creates a shared meaning about a process, a product, or an event." (Schrage, 1990, p. 40).

Coordination: A group relationship with a level of intensity lower than that of collaboration. It requires fewer formal resources and less commitment and time (Montiel-Overall, 2005).

Cooperation: A relationship among members involving a high level of trust and confidence (Montiel-Overall, 2005).

Teacher self-efficacy beliefs: This notion refers to the degree to which an individual teacher perceives him- or herself capable in providing effective teaching practices to improve student learning (Klassen, Tze, Betts, & Gordon, 2011).

Summary

This chapter has introduced constructivism in learning and teaching and the TALIS 2013 data set. Also, it has identified a need to investigate the factors associated with the teachers' constructivist beliefs, such as teachers' self-efficacy beliefs, teachers' professional activities, and principals' instructional leadership. It has presented a conceptual framework and stated the purpose of the study, the significance of the study, research questions, and hypotheses.

CHAPTER 2

Literature Review

Introduction

This chapter reviews the literature concerning teachers' beliefs, focusing on the framework of relationships between teachers' constructivist beliefs and teachers' self-efficacy beliefs, teachers' professional activities, subject areas, and principals' instructional leadership practices. To provide rational support for each proposed construct and hypothesis, the review summarizes and integrates empirical evidence from a range of studies. The literature was retrieved with the aid of search engines and several databases, such as Google Scholar, ERIC, EBSCOhost, and ProQuest.

The author asserts that factors that are associated with constructivist beliefs include teacher self-efficacy (e.g., Nie, Tan, & Liau, 2013), teacher co-operation (e.g., Goddard, Goddard & Tschannen-Moran, 2007; Hattie, 2009), and principal instructional leadership (e.g., Ham et al., 2013) (See Table 2.1).

Table 2.1

Sample References of Variable of Interest

Construct	Level	Sample References
Constructivist beliefs	Teacher	(Appleton, 2008; Alsup, 2004; Bybee et al., 2006; Hoy, et al., 2006; Khalid & Azeem, 2012; Lord, 1999; Marlowe & Page, 2005; Staub & Stern, 2002; Watters & Ginns, 2000; Woolfolk, 2010)
Teacher self-efficacy	Teacher	(Allinder, 1994; Bandura, 1977; 1993; 2006; Gibson & Dembo, 1984; Ghaith & Yaghi, 1997; Gist & Mitchell, 1992; Guskey, 1988; Pajares, 1996; Protheroe, 2008;

		Tschannen-Moran & Hoy, 2001; Tschannen-Moran et al., 1998; Woolfolk Hoy et al., 2006; Stein & Wang, 1988)
Teacher co-operation	Teacher	(Darling-Hammond, 2010; 2006; Darling-Hammond & McLaughlin, 1995; Darling-Hammond et al., 2009; de Vries et al., 2014; Frase, 2001; Goddard et al., 2007; Haycock, 1998; Montiel-Overall, 2005; Tschannen-Moran & Hoy, 2001;Wei et al, 2009)
Principal Instructional leadership	Principal	(Blase & Blase, 2000; Goddard et al., 2010; Gumus et al., 2013; Hallinger, 2005; Hallinger & Murphy, 1987; Hendriks & Steen, 2012; Leithwood et al., 2008; Pajak & McAfee, 1992; Parise & Spillane, 2010; Robinson et al., 2008)

Constructivist Beliefs and Instructions

H1: Teacher constructivist beliefs will vary among the schools

Instructional practices, as the core of a teacher's work, play a significant role in every classroom and impact student achievement in numerous ways (e.g., Seidel & Shavelson, 2007). Researchers and practitioners from various subject areas have studied teacher instructional practices and distinguished them in terms of two main categories: traditional (didactic) and constructivist (e.g., Alsup, 2004; Khalid & Azeem, 2012; Lord, 1999). Alsup (2004) conducted an experimental study to compare constructivist and traditional instruction among mathematics pre-service teachers. Khalid and Azeem (2012) compared the constructivist instructional approach with the traditional approach among pre-service teachers in an English class. Successful teachers were perceived as those who could implement various instructional practices in their classroom (Paek et al., 2005).

Traditional practices, as the most common approaches in teaching, were drawn from a behaviorist theoretical framework, which focuses on observed behaviors with the goal of behavioral change (Woolfolk, 2010). The followers of the traditional approach assume that there is a fixed subject matter that teachers must transfer with direct and authoritative instruction to students who must accept the information without questioning (Stofflett, 1998). Since this approach tends to emphasize a large amount of material given to students, students are perceived as passive learners. This leaves no room for interaction in class or for student initiated-questions, resulting in a teacher-centered classroom. Paek et al. (2005) provided some examples of this approach, such as giving lectures, utilizing multiple choice assessments, and instructor-led discussion (Paek et al., 2005).

In contrast, constructivist practices, such as student-centered learning, provide students with the opportunity to play an active role in their learning (Paek et al., 2005; Khalid & Azeem, 2012; Woolfolk, 2010), giving students an opportunity to construct knowledge and reach their own conclusion by themselves under less fixed conditions (Schuman, 1996). Basically, the followers of this approach assume that students will develop knowledge based on their previous knowledge and experience. This also allows them to correct their misconceptions, if there are any.

Numerous constructivist learning theorists have defined constructivism as a learner-centered learning theory – learning is an active process in which learners actively develop their own meaning or concept of things by asking questions, interacting with society, and interpreting the environment based up on their existing knowledge or experiences (Prawat, 1996; Thayer-Bacon, 1999; Windschitl, 1999a; Woolfolk, 2010). Woolfolk (2010) explained that there are two classes of constructivism: cognitive constructivism and social constructivism. The first one stems from the cognitive constructivism of Piaget, which focuses on the internal process of constructing meaning on the part of an individual person. The process includes the construction of internal representations, the modification of information, the information storing process, information retrieval, and information analysis. Social constructivism stems from Vygotsky's constructivism studies, which focuses more on societal elements and the interactions among learners.

A range of studies have reported factors that may hinder the use of constructivist instructions among classroom teachers (e.g., Appleton & Kindt, 2002; Appleton, 2008, Watters & Ginns, 2000). A number of studies have confirmed that teachers frequently found that it was difficult to be flexible in relation to students' responses since they lack the required subject knowledge (Appleton, 2008; Watters & Ginns, 2000). With a weak understanding of the concepts, teachers were unable to identify an incorrect conception when the students responded (Vlaardingerbroek & Taylor, 2003). Eltinge and Roberts (1993) listed the following reasons explaining why teachers in K-12 schools avoid the use of inquiry techniques:

1. Science teaching standards are more content-oriented than process-oriented.
2. It is more difficult to evaluate the effectiveness of learning in science using a method of inquiry than to measure the body of fact and information gained by students.
3. Science instruction relies on textbooks, which present science as a body of fact and information.

Also, there has been skepticism regarding the implementation of constructivist learning. Constructivist instruction is based on a theory, and it requires teachers to have a strong foundation of subject matter in order to support students' exploration (Beamer et al., 2008). Additionally, researchers also found that the majority of student teachers in teacher education programs have not only limited knowledge of science content, but also negative attitudes about science teaching (Appleton & Kindt, 2002; Kelly, 2000; Shallcross & Spink, 2002).

Over the past decades, numerous researchers have suggested that teacher beliefs are related to their selection of instructional practices and the students' outcomes (e.g. Bybee et al., 2006; Woolfolk Hoy, Davis, & Pape, 2006; Marlowe & Page, 2005; Muijs & Reynolds, 2002). The empirical evidence in previous studies showed that there were some differences in the degree of teachers' beliefs. Staub and Stern (2002) concluded that teacher beliefs influenced their instructional behaviors. Those who have more constructivist beliefs are likely to use more cognitively challenging tasks, which ultimately support the students' higher-order thinking skills. Since beliefs are essential when considering the use of new instructional practices, this study focuses on the teachers' constructivist beliefs, which are described as

> . . . a view of the teacher as the facilitator of learning with more autonomy given to students, whereas a direct transmission view sees the teacher as the instructor, providing information and demonstrating solutions. (OECD, 2014, p. 217)

Findings from TALIS 2008 indicated that there was significant variation in pedagogical beliefs at the teacher- and country-level (OECD, 2009). In particular, the researchers reported that the teachers' beliefs are heterogeneous within schools – teachers in the same school possess a wide variety of teaching beliefs because their beliefs had been formed previously and stayed unchanged, unless the school had provided a program to correct such heterogeneity (OECD, 2009).

Principal's Instructional Leadership

H2: Principal instructional leadership will have a positive direct effect on teacher constructivist beliefs.

H8a: The relationship between self-efficacy and teacher constructivist beliefs will be moderated by principals' instructional leadership.

H8b: The relationship between teacher co-operation and teacher constructivist beliefs will be moderated by principals' instructional leadership. Administration practices and leadership styles set the tone of the teaching and learning environments. Changes were adopted effectively in schools with strongly supportive and collaborative leaders (Parise & Spillane, 2010). In a range of studies, researchers concluded that school principals influenced their students' achievement through having an effect on teachers' behaviors, beliefs, and classroom practices (Hallinger, 2005; Hendriks & Steen, 2012; Leithwood et al., 2008). Researchers found that the influence of instructional leadership was three to four times larger than that of the common leadership practices (Robinson et al., 2008). In this study, the term principals' instructional leadership refers to the influence of school principals on teaching and learning in relation to instructional matters (Robinson et al., 2008; Hallinger, 2005; Blase & Blase, 2000). It can also refer to other actions that contribute to student progress, such as principal managerial behaviors (e.g., managing goals and resources) (Donmoyer & Wagstaff, 1990; Hallinger, 2005). The instructional leadership also provided theoretical support for the direct effects on teachers' competencies, practices, and beliefs (Blase & Blase, 2000; Hallinger, 2005; 2003).

Researchers reported a variety of instructional leadership practices, such as managing schools' goals and curricula, taking actions to improve instruction, and monitoring teacher and student outcomes (Robinson et al., 2008; Hallinger, 2005; Hallinger & Murphy, 1987). A range of empirical studies examined principals' instruction-related practices, for example, supervising and evaluating teachers in their instruction (Seashore Louis et al., 2010; Catano & Stronge, 2007;

Pajak & McAfee, 1992) and monitoring student outcome to improve instructional practices (Halverson, Grigg, Pritchett, & Thomas, 2007; Rice & Islas, 2001).

To broaden the understanding of the concept of instructional leadership, researchers included other associating factors in the school system beside principals' characteristics and student outcomes in the analyses. Numerous researchers investigated the associations between principals' instructional leadership and teacher classroom practices (e.g., Goddard, Neumerski, Goddard, Salloum, & Berebitsky, 2010; Heck & Moriyama, 2010; May & Supovitz, 2010), and instructional leadership practices with teachers' beliefs, motivation, satisfaction (e.g., Leithwood, Harris, & Hopkins, 2008; Leithwood & Jantzi, 2006), organizational learning (e.g., Levacic, 2005), teacher collaboration (e.g., Gumus, Bulut, & Bellibas, 2013), and professional development (e.g., Teddlie, 2005).

A recent study of Gumus, Bulut, and Bellibas (2013), using a sample of teachers and principals in Turkish primary school from the TALIS 2013 data set, revealed a positive relationship between instructional leadership and teacher collaboration and a negative relationship between administrative leadership and teacher collaboration. To be specific, supervising teachers in relation to their instruction, such as giving feedback on instructional matters, associated positively with teacher collaboration. Their results are in line with previous literature – providing feedback, as the most essential component in leadership, encourages teachers' collaboration (McHenry, 2009). Gumus, Bulut, and Bellibas (2013) concluded that we should expect to find more teacher collaboration in schools that have a principal with strong instructional leadership.

The primary objective of instructional leadership is to improve instructional practices by positively influencing instructional practices and beliefs among classroom teachers (Blase &

Blase, 2000). Hence, school principals with a strong of instructional leadership will positively influence the teachers' beliefs, which will indirectly improve teachers' practices and students' achievement.

Self-Efficacy Beliefs

H3a: Self-efficacy belief will have a direct effect on teacher constructivist beliefs.

H3b: The effect of self-efficacy will vary among the schools.

Besides teacher's beliefs regarding instructional practices, teachers' beliefs about their own capability to perform a specific action shaped their professional behaviors (Woolfolk Hoy, Davis & Pape, 2006). Efficacy belief, as a psychological construct, refers to the degree to which a person perceives him or herself as capable to perform a certain action (Bandura, 1999; 2006; Gist & Mitchell, 1992; Pajares, 1996; Tschannen-Moran & Hoy, 2001). According to Bandura (1977), self-efficacy was linked to a person's choice of actions, determination, and persistence. Bandura (1977) explained that a person with a strong sense of efficacy would participate in an assigned task immediately, while a person with a lower sense of efficacy would be likely to avoid it. When a difficult task is given, a person with high efficacy tends to make more effort and be more determined to accomplish the given task than those with lower efficacy. Nevertheless, to achieve competent performance, a person needs to have both self-efficacy and adequate required skills (Bandura, 1977).

In this study, teacher self-efficacy refers to the level of a teacher's belief in his or her ability to perform certain actions related to the teaching profession (e.g., implementing classroom practices or improving student outcomes) (Tschannen-Moran, Hoy, & Hoy, 1998; Guskey & Passaro, 1994; Gibson & Dembo, 1984). Researchers reported that teacher self-efficacy is related to teachers' behavior in the classroom, teaching effort, goals, aspiration level

(Tschannen-Moran, Hoy, & Hoy, 1998), school structure (e.g., middle school, junior high) (Ashton & Webb, 1986), salaries, professional isolation, uncertainty (Webb & Ashton , 1987), the teacher's attitude, and student achievement (Bandura, 1993).

Teachers with high self-efficacy tend to 1) take more risks and try innovative instructional practices that address student learning needs (Ghaith & Yaghi, 1997; Guskey, 1988; Protheroe, 2008), 2) have a high level of planning and organizing of instructional activities (Allinder, 1994; Protheroe, 2008), 3) have higher job satisfaction (Klassen et al., 2009; Skaalvik & Skaalvik, 2010; Ware & Kitsantas, 2007), 4) have lower burnout rate (Skaalvik & Skaalvik, 2010), 5) participate more in professional development (Bumen, 2009; Ross & Bruce, 2007), 6) engage in "focused instructional practices" – rapid pace teacher-guided instruction (Wahlstrom & Louis, 2008), and 7) be willing to participate in professional collaboration (da Costa & Riordan, 1996).

There is substantial evidence that teachers' self-efficacy beliefs are closely linked with their classroom practices and engagement (Tschannen-Moran, Woolfolk Hoy & Hoy, 1989). Hence, self-efficacy beliefs are essential when the adoption of new instructional practices is considered, especially when the new standards are introduced.

Teacher Co-operation

(Professional Collaboration and Exchange and Coordination for Teaching)

H4a: Teacher co-operation will have a direct positive effect on teacher constructivist beliefs.

H4b: The effect of teacher co-operation will vary among schools.

Teacher practices are not only the instructional activities within the classroom, but also professional activities outside the classroom, such as the interactions among teachers and other stakeholders with regard to teaching and learning (Darling-Hammond et al., 2009; Danielson &

McGreal, 2000). Montiel-Overall (2005) proposed collaboration among teachers as a potential element that could help in the re-structuring of schools and curricula for student achievement. The author stated that professional collaboration combined the strength of multiple collaborators in a productive relationship, which, ultimately, influenced the learning of students (Montiel-Overall, 2005). Similarly, Haycock (1998) found that professional collaboration increased the possibilities of new ways of teaching, which could improve the process of content delivery.

The challenges and complexities of teaching make teachers' professional collaboration increasingly important. Studies have confirmed that teachers will address and fulfill their students' needs better if the teachers work together when they encounter issues relating to teaching practices (Darling-Hammond, 2010; Vescio, Ross, & Adams, 2008). Darling-Hammond's study (2010) supported that conclusion and provided examples from South Korea, Singapore, and Finland.

Darling-Hammond (2006) also emphasized the importance of preparing teachers as researchers and collaborators. The author explained that knowledge about teaching and learning has grown extensively and that several teaching practices have been adapted to meet the diverse needs of learners. As a result, it is difficult for an individual teacher to keep up with and master all of the requirements by him or herself. The author suggested that teachers should learn from one another. To make possible powerful learning on the part of the students, schools need to provide powerful learning to their teachers (Feiman-Nemser, 2001). Therefore, schools should include professional collaboration in teachers' professional development programs (Darling-Hammond & McLaughlin, 1995; Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009).

Although there are only a small number of empirical studies confirming the influence of teacher collaboration on students' achievement, numerous studies have stated that there is a clear link between professional collaboration and pedagogical practices (Goddard & Heron, 2001; Harris, 2002; Tse, 2007). A study by Erb (1995) reported that the teachers were more focused on students' outcomes when the teachers worked collaboratively and felt less isolated. The more they work together, the more they can comprehend knowledge in teaching and learning, which, ultimately, improves their classroom instruction. Activities that allow teachers to work collaboratively include 1) instructional materials exchange, 2) curriculum development, 3) student progress discussion, 4) joint-learning activities (Ying, 2007; Goddard, Goddard & Tschannen-Moran, 2007), and 5) peer observations (Frase, 2001; Tschannen-Moran & Hoy, 2001).

Researchers have reported a positive association between frequent classroom observation and self-efficacy beliefs, attitudes toward professional development, and instructional improvement (Frase, 2001; Tschannen-Moran & Hoy, 2001). A recent study by de Vries et al. (2014) investigated the relationship between teachers' professional development and teachers' beliefs. The authors classified teachers' beliefs into 2 groups: student-oriented and subject-matter-oriented. Professional development activities were separated into 3 groups: 1) updating their knowledge and skills (e.g., making the effort to read professional literature and attending workshops), 2) reflective activities, and 3) collaboration among colleagues (e.g., exchange activities, team teaching, and developing materials together). The authors concluded that each of the three groups of professional development activities has a significant relationship with teachers' student-oriented beliefs.

Summary

This chapter discusses previous studies concerning teachers' constructivist beliefs, self-efficacy beliefs, teacher co-operation, and principals' instructional leadership practices. To support the proposed hypotheses, this chapter presented an overview of the inter-correlations among these beliefs and practices found in previous research.

CHAPTER 3

Methodology

Research Design

The objective of this study was to examine the relationship between teachers' constructivist beliefs and 1) principals' instructional leadership, 2) teachers' self-efficacy beliefs, and 3) teacher co-operation in a sample of three countries (South Korea, Finland, and Mexico) that participated in the Teaching and Learning International Survey (TALIS) of 2013.

Since the TALIS data set has a hierarchical structure where teachers were nested within schools, all of the teacher- and school-level variables could potentially associate with teachers' constructivist beliefs. According to the literature, teachers in a school shared variance in a variety of beliefs and practices which may be owing to their school affiliation or their school principal. This homogeneity, a statistical dependency, is a violation of the independency assumption which is required for a regression model. Researchers have stated that ignoring the multilevel or nested structure may increase underestimate standard errors (Raudenbush & Bryk, 2002) and lead to Type I errors and erroneous conclusions (Snijders & Bosker, 1999; Raudenbush & Bryk, 2002). Therefore, a two-level hierarchical linear model (HLM) was employed to test the research hypotheses (Hox, 2010; Raudenbush & Bryk, 2002; Snijders & Bosker, 1999). With this method, the author can differentiate among the variation of teachers' constructivist beliefs at different levels. It is important to note that the HLM can take the dependency of data into consideration when the assumption of independence necessary for traditional statistical analysis is violated.

There were 2 types of variables in the proposed hypotheses: 1) level-1 or teacher-level variables (e.g., constructivist beliefs, self-efficacy beliefs, teacher co-operation, teacher background) and 2) the level-2 or school-level variable (i.e., principals' instructional leadership).

The effects of the 5 level-1 predictors will be estimated as fixed and random effects. The effect of the level-2 predictor were estimated as a fixed effect. The literature suggested cross-level interactions: 2 cross-interactions will be tested for (See Table 3.1).

The study's hypotheses were:

H1: Constructivism will vary among the schools.

H2: Principal instructional leadership will have a positive direct effect on teacher constructivist beliefs.

H3a: Teachers' self-efficacy will have a direct effect on teacher constructivist beliefs.

H3b: The effect of teachers' self-efficacy will vary among the schools.

H4a: Teacher co-operation will have a direct positive effect on teacher constructivist beliefs.

H4b: The effect of teacher co-operation will vary among schools.

H5a: Amount of experience will have a direct effect on teacher constructivist beliefs.

H5b: The effect of amount of experience will vary among schools.

H6a: Class size will have a direct effect on teacher constructivist beliefs.

H6b: The effect of class size will vary among schools.

H7a: Percentage of time teaching time will have a direct effect on teacher constructivist beliefs.

H7b: The effect of percentage of teaching time will vary among schools.

H8a: The relationship between self-efficacy and teacher constructivist beliefs will be moderated by principals' instructional leadership.

H8b: The relationship between teacher co-operation and teacher constructivist beliefs will be moderated by principals' instructional leadership.

Table 3.1

Research Hypotheses with Types of Effects

Hypothesis	Effect	Type
H1	-	-
H2	PINCLEADS → TCONSB	Fixed
H3a,b	TSELEFFS → TCONSB	Fixed/Random
H4a,b	TCOOPS → TCONSB	Fixed/Random
H5a,b	YRSEXP → TCONSB	Fixed/Random
H6a,b	CLASSSIZ → TCONSB	Fixed/Random
H7a,b	TIMETEAC → TCONSB	Fixed/Random
H8a	PINCLEADS → (TSELEFFS → TCONSB)	Cross-level Interaction
H8b	PINCLEADS → (TCOOPS→ TCONSB)	Cross-level Interaction

Considerations Regarding the Cross-national Study

Unlike the cognitive skills and educational attainment indices, which were calculated from the objective quantitative indicators, the conceptual framework for this study consisted of several self-reported psychological constructs. According to Heck (1996), these psychological constructs may not be comparable across countries. Without a confirmation that the constructs show invariance across countries, the differences found in the analysis are more likely due to the cultural interpretations rather than actual differences in the construct (van de Vijver & Leung, 1997). It is important to note that researchers found substantial cross-cultural bias in the scales measuring teachers' and principals' beliefs and practices in TALIS 2008, making these scales less comparable. One explanation for this situation was that the teacher population was largely varied, in terms of their age, education, and specialization (OECD, 2014).

In TALIS 2013, three hierarchical levels of cross-cultural invariances, 1) configural, 2) metric, and 3) scalar, were examined across countries through multi-group confirmatory factor analysis (MGCFA) (OECD, 2014). Configural invariance would be achieved if the model of all groups (countries) had identical factor structure and identical underlying variables within factors. This also requires an adequate model data fit, where CFI $\geq$ 0.90, TLI $\geq$ 0.90, RMSEA $\leq$ 0.8, and SRMR $\leq$ 0.1. Metric invariance, which requires configural invariance, would hold if the same dimensional structure factors were found and the factor loadings were equal across countries. Last, after the metric invariance has been achieved, scalar invariance, as the most rigorous form of invariance, requires that all intercepts be identical across countries (OECD, 2014).

According to the TALIS 2013 technical report, the highest invariance established for our proposed constructs (constructivist beliefs, self-efficacy beliefs, professional collaboration, and instructional leadership) is the metric invariance. All of the scales lack model-data agreement at the scalar level of invariance. Hence, comparisons of the scale mean scores need to be interpreted with considerable caution (OECD, 2014).

Data Source: TALIS 2013 Data Set

The author utilized the international data set of the Teaching and Learning International Study (TALIS) 2013, developed by the Organization for Economic Co-operation and Development (OECD). TALIS 2013 was the second and most recent international survey of teachers and principals in the lower secondary schools from 34 countries and sub-national entities. This data set was downloaded from: http://stats.oecd.org/Index.aspx?datasetcode=talis_2013%20.

TALIS 2013 employed two-stage stratified cluster sampling in order to obtain nationally representative sampling. Specifically, TALIS 2013 selected 200 lower secondary schools per country, this number determined using probability proportional to size technique for the first stage sampling. Then TALIS 2013 randomly recruited at least 20 teachers, who teach regular classes, and recruited one school leader from each school (OECD, 2014). Teacher and principal questionnaires include questions related to background characteristics, work experience and professional activities, student body characteristics, school leadership management, teaching conditions, school climate, and job satisfaction (OECD, 2014).

Target Population and Study Samples

The Learning Curve Index [http://thelearningcurve.pearson.com/]

Table 3.2

Overall Index Rank and Score - Z-Score (Pearson, 2014)

Rank	2014	2012
1	**South Korea (1.30)**	**Finland (1.26)**
2	Japan (1.03)	**South Korea (1.23)**
3	Singapore (0.99)	Hong Kong – China (0.90)
4	Hong Kong – China (0.96)	Japan (0.89)
5	**Finland (0.92)**	Singapore (0.84)
6	United Kingdom (0.67)	United Kingdom (0.60)
7	Canada (0.60)	Netherlands (0.59)
8	Netherlands (0.58)	New Zealand (0.56)
--	--	--
38	Brazil (-1.73)	**Mexico (-1.60)**
39	**Mexico (-1.76)**	Brazil (-1.65)
40	Indonesia (-1.84)	Indonesia (-2.03)

Note: Scores developed by the Economist Intelligence Unit

To make it possible to learn from situations at both poles – involving high and low performers – this study selected South Korea, Finland, and Mexico for the analysis. South Korea (Group #1) and Finland (Group #2) represent the high performers in cognitive skills and educational attainment. Despite having very different approaches in their teaching and educational systems, South Korea and Finland have been clear leaders on the index and have maintained about one standard deviation above the mean for two consecutive years. Mexico (Group #5), representing a group of low performers on the learning curve index, has had approximately 1.7 standard deviation below the mean for two consecutive years. Indonesia, with almost 2 standard deviation below the mean, was not selected because Indonesia did not participate in TALIS 2013. This selection was based on the overall index scores, which were calculated by the Economist Intelligence Unit (EIU) with assistance from an advisory panel of education experts around the world (see Table 3.2). The latest index from the Learning Curve report (2014) included numerous internationally comparable education data in the analysis.

In order to present a portrait of countries' performance regarding their education output, the EIU included two groups (cognitive skills and educational attainment) of numerous objective quantitative indicators in the calculation:

1) Cognitive skills: Progress in International Reading Literacy Study (PIRLS), Trends in International Mathematics and Science Study (TIMSS), and the Program for International Student Assessment (PISA)
2) Educational attainment: literacy rate and graduation rate at the upper secondary and tertiary levels and the initial output from the Program for the International Assessment of Adult Competencies (PIAAC)

The calculation process included normalizing all the values to Z-scores, enabling a comparison across countries and an aggregation across data sets. As suggested by the advisory panel, the index scores were weighted two-thirds to the cognitive skills and one-third to the education attainment categories. Under the cognitive skills category, Grade 8 tests scores were weighted 60%, while Grade 4 tests scores were weighted 40%. Reading, Mathematics, and Science were equally weighted. As for the educational attainment category, the literacy rate and graduation rates were weighted equally (Pearson, 2014).

This study's sample consisted of 3 countries: South Korea, Finland, and Mexico. Table 3.3 presents numbers of target population by country. Table 3.4 presents the teacher and school sample sizes for each of the countries.

Table 3.3

Target Population

Country	ISED Level-2 Schools	ISED Level-2 Teachers
South Korea	3,183	110,658
Finland	734	unknown
Mexico	15,881	315,829

Table 3.4

Study Samples

Country	Participating Schools	Responding Teachers
South Korea	177	2,933
Finland	146	2,739
Mexico	162	3,138

Measurement Scales

This study intended to use constructed latent variables developed by multiple single rating-scale items. Although these items are measured in ordinal level (e.g., 1 “not at all”, 2 “to some extent”, 3 “quite a bit”, and 4 “a lot”), the constructed latent variables provide continuous scales.

The constructivist beliefs (TCONSBS) variable was developed using 4 items. Each item measures the teachers’ beliefs about teaching and learning. The teachers responded to each statement in the teachers’ questionnaire using a 4-point scale: 1 “strongly disagree,” 2 “disagree,” 3 “agree,” and 4 “strongly agree.” The reliability coefficients for the target countries ranged from 0.66 – 0.84. Although there is no cut-off point for reliability coefficient values, Cronbach’s alpha over 0.70 has been accepted as the recommended value (Hair et al., 2010).

Teachers' self-efficacy (TSELEFFS) variable was developed using 12 items. In TALIS report, the reliability index of TSELEFFS was represented through the reliability coefficients of the SECLSS, SEENGS and SEINSS. The efficacy in classroom management (SECLSS), efficacy in instruction (SEINSS), and efficacy in student engagement (SEENGS) variables were each developed using 4 items. Each item has a 4-point rating scale, measuring the extent to which a teacher doing a given activity believes himself/herself capable to do it effectively. The measurement scale is 1 indicating "not at all," 2 indicating "to some extent," 3 indicating "quite a bit," and 4 indicating "a lot." The reliability coefficients for target countries ranged from 0.84 – 0.88 for SECLSS, 0.77 - 0.85 for SEINSS, and 0.73 – 0.86 for SEENGS.

Teacher co-operation (TCOOPS) variable was created using 8 items. The reliability index of TCOOPS was represented through the reliability coefficients of the TCEXCHS and TCCOLLS. Exchange/coordination for teaching (TCEXCHS) and professional collaboration (TCCOLLS) variables were each measured by 4 items. These 6-point scale item statements were intended to measure the frequency of professional activity engaged in by the individual teacher. The measurement scales are 1 representing "never," 2 representing "once a year or less," 3 representing "2-4 times a year," 4 representing "5-10 times a year," 5 representing "1-3 times a month," and 6 representing "once a week or more." The reliability coefficients ranged from 0.67 - 0.78 for TCESCHS and from 0.50 - 0.67 for TCCOLLS.

The principal Instructional leadership (PINSLEADS) variable was developed using 3 single items. Each item was intended to measure how frequently the principal engaged in given activities during a year. The principal responded to a 4-point scale: 1 "never or rarely," 2 "sometimes," 3 "often," and 4 "very often." The reliability coefficients ranged from 0.69 – 0.80.

Table 3.5 presents the alpha coefficients, numbers of measurement item, and scale of the variables of interest. Table 3.6 presents the scale and wording of each measurement item.

Table 3.5

Measurement Tools, Scales, and Reliability Coefficient Alpha by Country (TALIS, 2013)

Construct	**Number of items**	**Scale**	**Cronbach's alpha across population**	
Constructivist beliefs (TCONSB)	4	4-point scale, ranging from "strongly disagree" to "strongly agree"	South Korea Finland Mexico	0.843 0.663 0.681
Self-efficacy in classroom management (SECLSS)	4	4-point scale, ranging from "not at all" to "a lot"	South Korea Finland Mexico	0.876 0.845 0.777
Self-efficacy in instruction (SEINSS)	4	4-point scale, ranging from "not at all" to "a lot"	South Korea Finland Mexico	0.850 0.768 0.767
Self-efficacy in student engagement (SEENGS)	4	4-point scale, ranging from "not at all" to "a lot"	South Korea Finland Mexico	0.847 0.818 0.687
Professional collaboration (TCCOLLS)	4	6-point scale, ranging from "never" to "once a week"	South Korea Finland Mexico	0.674 0.627 0.645
Exchange and coordination for teaching (TCEXCHS)	4	6-point scale, ranging from "never" to "once a week"	South Korea Finland Mexico	0.781 0.689 0.802
Instructional leadership (PINSLEADS)	3	4-point scale, ranging from "never or rarely" to "very often".	South Korea Finland Mexico	0.731 0.689 0.756

Table 3.6

Variables and Measurement Items

Construct	Scale	Items	Wording
Constructivist beliefs (TCONSB)	Continuous	TT2G32A	My role as a teacher is to facilitate students' own inquiry
		TT2G32B	Students learn best by finding solutions to problems on their own
		TT2G32C	Students should be allowed to think of solutions to practical problems themselves before the teacher shows them how they are solved
		TT2G32D	Thinking and reasoning processes are more important than specific curriculum content
Teachers' self-efficacy (TSELEFFS)	Continuous	TT2G34D	Control disruptive behavior in the classroom
		TT2G34F	Make my expectations about student behavior clear
		TT2G34H	Get students to follow classroom rules
		TT2G34I	Calm a student who is disruptive or noisy
		TT2G34C	Craft good questions for my students
		TT2G34J	Use a variety of assessment strategies
		TT2G34K	Provide an alternative explanation or example when students are confused
		TT2G34L	Implement alternative instructional strategies in my classroom
		TT2G34A	Get students to believe they can do well in school work
		TT2G34B	Help my students value learning
		TT2G34E	Motivate students who show low interest in school work
		TT2G34G	Help students think critically
Teacher co-operation (TCOOPS)	Continuous	TT2G33A	Teach jointly as a team in the same class
		TT2G33B	Observe other teachers' classes and provide feedback
		TT2G33C	Engage in joint activities across different classes and age groups (e.g. projects)
		TT2G33H	Take part in collaborative professional learning
		TT2G33D	Exchange teaching materials with colleagues

		TT2G33E	Engage in discussions about the learning development of specific students
		TT2G33F	Work with other teachers in my school to ensure common standards in evaluations for assessing student progress
		TT2G33G	Attend team conferences
Instructional leadership (PINSLEADS)	Continuous	TC2G21C	I took actions to support co-operation among teachers to develop new teaching practices
		TC2G21D	I took actions to ensure that teachers take responsibility for improving their teaching skills
		TC2G21E	I took actions to ensure that teachers feel responsible for their students' learning outcomes
Amount of work experience (YRSEXP)	Continuous	Background	How many years of work experience do you have?/ Year(s) working as a teacher in total
Class size (CLASSSIZ)	Continuous	Teaching	How many students are currently enrolled in this <target class>?
Time spent on actual teaching (TIMETEAC)	Continuous	Teaching	Percentage of <class> time is typically spent on/ Actual teaching and learning

Data Analysis

Evaluation of Missing Data

A range of literature on statistical methods provided guidelines on how to deal with missing data (e.g., Brick & Kalton; 1996; Buhi, Goodson, & Neilands, 2008). The issue of missing data should be handled properly because it may bias the parameter estimates, inflate Type I and II error rates, lower the CI level, and ultimately, lead to an incorrect conclusion (Collins, Schafer, & Kam, 2001). Survey studies may contain three types of data missing-ness: missing at random (MAR), missing completely at random (MCAR), and missing not at random (MNAR). While MNAR can lead to biases, an analysis of data with MAR and MCAR tends to be unbiased. Therefore, researchers have deleted cases with MNAR and imputed those with MAR and MCAR (Larsen, 2011).

Researchers have listed strategies for dealing with missing data: deletion (pairwise and listwise), direct estimate, and imputation techniques. Numerous researchers have recommended the use of maximum likelihood (ML) and multiple imputations (MI) to handle missing data in complex surveys (Peugh & Enders, 2004). In the TALIS 2013 report, the maximum likelihood (ML) with the expectation-maximization (EM) algorithm was used for the model with missing data in order to produce unbiased parameters (OECD, 2014). In this study, missing values were treated using the algorithm in ML with EM through the use of SPSS version 22.

Estimation Requirements

Since TALIS 2013 employed a stratified multi-stage probability sampling plan with unequal probabilities of selection (e.g., schools were selected with unequal probabilities – larger schools had a higher chance of being selected), researchers should take the unequal weights and the structure of the TALIS samples into account in performing the analysis. Researchers can do so by using replication methods (e.g., resampling, Balanced Repeated Replication (BRR), Jackknife, or the Bootstrap) to compute unbiased estimates of the population parameters. The International Database (IDB) analyzer application (http://www.iea.nl/data.html), developed by the IEA Data Processing and Research Center (IEA DPRC), was designed for this purpose. The IDB analyzer can be used in conjunction with IBM's SPSS to merge the variables of interest into an SPSS file and to compute unbiased descriptive data using appropriate teacher, school, and replication weights (OECD, 2014). According to the TALIS 2013 guide,

> The estimation weight or final weight is the device that allows the production of country-level estimates from the observed sample data. The estimation weight indicates how many population units are represented by a sampled unit. The final weight is the combination of many factors reflecting the probabilities

of selection at the various stages of sampling and the response obtained at each stage. (p.126)

The author of this study used the IDB analyzer to generate SPSS data files and to produce unbiased descriptive data for three countries (South Korea, Finland, and Mexico). Then the author used HLM version 7.01 for Windows (http://www.ssicentral.com/hlm/downloads.html) to test the proposed hypotheses regarding the 2-level HLM with full maximum likelihood (FML) (Raudenbush & Bryk, 2002). The weightings were specified for both levels. The school estimation weight, which was applied to level 2, is the product of the school base weight (WGTFAC1) and the school non-response adjustment factor (WGTADJ1).

$$SCHWGT = WGTFAC1 * WGTADJ1$$

The final teacher weight is the product of the teacher base weight (WGTFAC2), three adjustment factors (WGTADJ2, WGTADJ3, WGTADJ4), and the final school weight (SCHWGT).

$$TCHWGT = (SCHWGT) \times (WGTFAC2 \times WGTADJ2 \times WGTADJ3 \times WGTADJ4)$$

Since both weights were used simultaneously in the analysis, the final teacher weight was divided by the school estimate weight to exclude the school estimate weight from the final teacher weight. As a result, the new teacher weight reflected only the base weight and the three adjustment factors.

TCHWGT-New= TCHWGT/ SCHWGT

Intra-Class Correlations (ICC) and Design Effect

The homogeneity of the observations from within a group can be measured through the intraclass correlation coefficient (ICC). The ICC indicates the degree of clustering by determining whether individuals within groups (e.g. schools) are more similar on the outcome than those between groups. The values range from 0 to 1, where 0 indicates perfect independence (Bliese, 1998). To illustrate, if the ICC value for a model in which teachers were nested within a school is 0.75, it means that 75% of the difference between teachers was related to the school. Therefore, when the ICC value is substantial, HLM is recommended.

However, Nezlek (2008) argued that using a low ICC to justify a decision not to use HLM is dangerous because no substantial variance found between-group in a measure does not imply that the relation between this measure and other measures is the same in other groups. The author concluded that even though the ICC value is close to zero, indicating the independency of the observations, HLM might still be necessary (Nezlek, 2008).

The ICC can be calculated as follows:

ICC or $\rho = \frac{S_b^2}{S_w^2 + S_b^2}$

Where S_b^2 equals the variance between groups, and S_w^2 equals the variance within groups.

Additionally, a design effect, which was a function of ICC, was also used as an indicator of whether multilevel analysis was necessary (Muthén & Satorra, 1995). If the ICC was larger than 2, it would indicate that the variance in between-school level accounted for a significant amount of the overall variance. Hence, multilevel analysis was an appropriate test. The design effect was calculated using this formula:

Design effect = 1+ (averaged cluster size-1)*ICC

Confirmatory Factor Analysis (CFA)

The TALIS questionnaires contained single items that can be combined to develop a latent construct to determine an unobserved variable, such as beliefs or attitude (OECD, 2014). The Mplus with the settings "type is complex," "stratification," and "cluster" was employed to conduct Principal Component Analysis (PCA) and Multi-group Confirmatory Factor Analysis (MGCFA) in order to develop scale indices or the latent variables in the TALIS report (OECD, 2014). These latent variables are variables that cannot be directly observed or measured, so we must measure them indirectly with single indicators, such as questionnaire items (Etchegaray & Fischer, 2010). The combined items will provide more reliability and validity than single items (OECD, 2014).

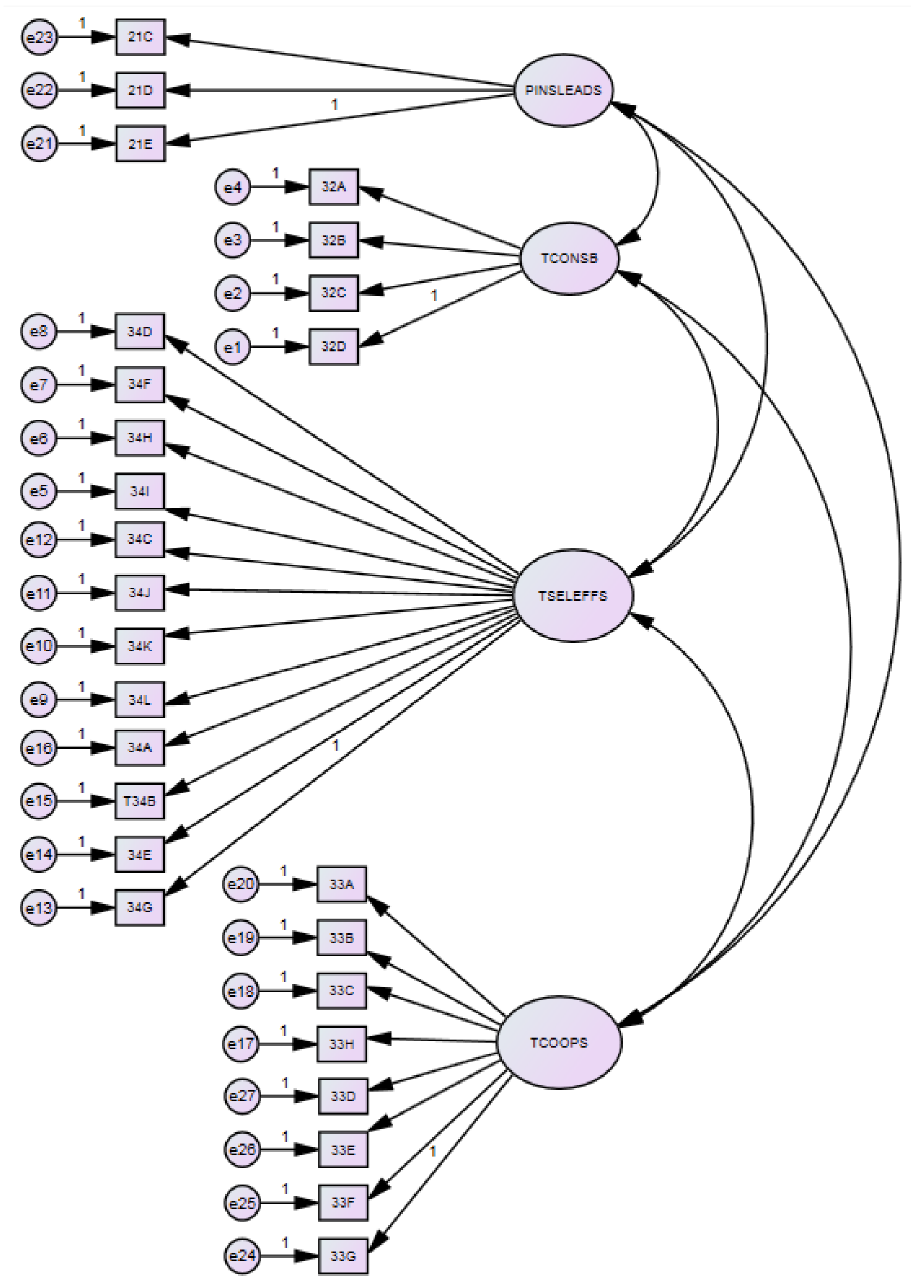

Figure 3.1. The CFA Measurement Model

Confirmatory factor analysis (CFA), as part of a measurement model, is commonly employed to examine and re-specify the dimension structure of the latent variables (Brown, 2006). In this study, CFA was employed to determine whether the theoretically proposed model fits the data (see Figure 3.1.). CFA results provided evidence for the convergent and discriminant validity of the proposed constructs (Hair, Anderson, Tathan, & Black, 2010; Kline, 2005). Table 3.7 summarizes the Goodness-of-fit indices used for this study's measurement model.

Table 3.7

Goodness-of-fit indices for CFA Model (Joreskog & Sorbom, 1993; Hu & Bentler, 1999; Kline, 2005)

Goodness-of-fit Index	Acceptable Adequate Model Fit
Comparative fit index (CFI)	≥ .90
Goodness-of-fit (GFI)	≥ .90
Adjusted goodness-of-fit (AGFI)	≥ .90
Root mean square error of approximation (RMSEA)	< .08
Standardized root mean square residual (SRMR)	≤ .10

Validity and Reliability

To validate a psychological construct, two types of evidence are necessary: convergent validity and discriminant validity (Gefen & Straub, 2005; Strauss & Smith, 2009). Confirmatory factor analysis (CFA) has been widely used to generate such evidence (DiStefano & Hess, 2005). Convergent validity is demonstrated by a moderate to high level of association or by inter-correlation among measurement items in the same constructs (Campbell & Fiske 1959; Kline, 2005). When a construct achieves good convergent validity, its measurement items are strongly or moderately correlated to the theoretical construct and weakly correlated with all other constructs. Average variance extracted (AVE), representing a variance captured by a construct, is commonly used to provide evidence for both convergent and discriminant validity. It can be calculated manually using the following formula:

$$\text{AVE} = \frac{\text{sum of the squared standardized factor loadings}}{\text{sum of the squared standardized factor loadings} + \text{sum of the indicator measurement error}}$$

The general guidelines are that 1) a given construct should have a value of the AVE that is larger than the square correlation of the given construct with any other constructs and 2) each construct should have an AVE value higher than 0.50 (Fornell and Larcker, 1981; Hair et al., 2010). Good evidence of discriminant validity, as opposed to evidence for convergent validity, shows that measurement items of a construct are not highly correlated with other measurement items from different constructs. Also, successful discriminant validity requires that the measurement items have a higher factor score loading on their theoretical construct than on other constructs in the model (Gefen & Straub, 2005).

The reliability of the instrument, or Cronbach's alpha, is the measure of the instrument's internal consistency – whether a set of measurement items that was proposed to measure a hypothetical construct produce the same scores. The coefficient value ranges from 0 – 1. The higher the score, the more reliable the construct. A rule of thumb is that acceptable levels of reliability are greater than 0.90 "excellent," greater than 0.80 "very good," or greater than 0.70 ("adequate") (Kline, 2005). However, a very high coefficient, greater than 0.95, is not desired. Such a high coefficient indicates that there is a redundancy in the measurement items (Streiner, 2003). However, researchers have argued that the Cronbach's coefficient underestimates the true reliability. An alternative coefficient is composite reliability. Peterson and Kim (2013) examined the true reliability produced by composite reliability and the coefficient alpha. Although composite reliability always produces a larger value, the difference between the two values is not practically meaningful. Hence, the composite reliability and the alpha coefficient can be used interchangeably (Peterson & Kim, 2013). Composite reliability can be calculated manually with the following formula:

$$\text{CR} = \frac{(\text{sum of standardized loading})^2}{(\text{sum of standardized loading})^2 + \text{sum of the indicator measurement error}}$$

Goodness-of-fit Indices and Model Comparison

The two most common methods of estimation are Maximum Likelihood (ML) and Generalized Least Square (GLS). Generally, ML selects those parameter estimates that maximize the likelihood of the data, while GLS seeks those parameters estimates that minimize the sum of the squared residuals. ML estimate is available in HLM 7, SPSS, and SAS Proc Mixed. GLS estimate is available in MLwIN and STATA xtmixed.

ML estimate can be accomplished using either full maximum likelihood (ML) or restricted maximum likelihood (REML). Both estimators produce identical estimates of the fixed effects (regression coefficients) for the two-level model. However, they differ in their estimating of the variance components. If the number of level 2 units are small, REML will produce variance estimates that are less biased than those of ML (Snidjers & Bosker, 1999). For the purpose of model fit comparison, the full maximum likelihood (ML) was employed as an estimation technique in this study since it produces goodness of fit statistics that apply to the entire model, while the REML produces goodness of fit statistics that apply to random effects – two competing models must have identical fixed effects (Raudenbush & Bryk, 2002).

To compare and select the best fit model, the author adopted 3 goodness-of-fit indices: 1) the likelihood ratio test or deviance test, 2) Akaike Information Criterion (AIC), and 3) the Bayesian Information Criterion (BIC).

The likelihood ratio test compares the deviance statistics from two competing models. The test computes the difference in deviance statistics and compares it to an appropriate chi-square distribution. A general rule for AIC and BIC is to select the model that has the lowest

AIC or BIC. A smaller value indicates better fit. The values of the AIC and the BIC can be below zero. AIC and BIC are both penalized in the log-likelihood statistics for the complexity of the model (O'Connell & McCoach, 2008). Both criteria can be calculated using deviance test statistics.

$AIC = D + 2p$; where D is deviance and p is the number of parameters in the model.

$BIC = D + ln(n) * p$; where D is deviance, p is the number of parameters in the model, and n is a level-one sample size.

As such, the BIC is considered a more conservative index than the AIC. If the difference between the BIC values is less than 2, it implies that the two competing models do not have any substantial difference. If the difference is greater than 10, the two competing models are substantially different (Kwok et al., 2008).

The author proposes 4 models: 1 fully unconditional model and 3 conditional models.

Model A – A Null Model as Baseline for Model Fit

This model contained no explanatory variables. It had only one random intercept, which could be varied across schools. This model produced an estimate of the intra-class correlation (ICC) to determine if HLM was necessary for the analysis. ICC presents the degree of constructivist beliefs variance that are accounted for by the school level.

Level 1: $TCONSB_{ij} = \beta_{0j} + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + u_{0j}$

Combined Model:

$TCONSB_{ij} = \gamma_{00} + u_{0j} + r_{ij}$

$TCONSB_{ij}$ = Constructivist Beliefs at Level-1 for teacher i in school j

β_{0j} = Intercept for constructivist beliefs in school j

r_{ij} = A random effect of prediction of teacher i in school j

γ_{00} = Overall intercept, that is, the grand mean of the constructivist beliefs across all schools

μ_{0j} = A random effect for the deviation of the intercept of a school from the overall intercept (unique effect of school j on the intercept: have a mean of 0 and variance tau_{00})

Model B – The Random-Intercept Model with Level-1 & Level-2 variables

This model contained all predictors with fixed effects and the random intercept. It contained 1) all of the level-1 predictors: teachers' self-efficacy (TSELEFFS), teacher co-operation (TCOOPS), amount of experience (YRSEXP), number of students enrolled in a target class (CLASSIZ), and percentage of time spent on teaching in class (TIMETEAC); and 2) the level-2 predictor: principals' instructional leadership (PINSLEADS).

Level 1: $TCONSB_{ij} = \beta_{0j} + \beta_{1j}*(YRSEXP_{ij}) + \beta_{2j}*(TSELEFFS_{ij}) + \beta_{3j}*(TCOOPS_{ij})$

$+ \beta_{4j}*(CLASSSIZ_{ij}) + \beta_{5j}*(TIMETEAC_{ij}) + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}*(PINSLEAD_j) + u_{0j}$

$\beta_{1j} = \gamma_{10}$

$\beta_{2j} = \gamma_{20}$

$\beta_{3j} = \gamma_{30}$

$\beta_{4j} = \gamma_{40}$

$\beta_{5j} = \gamma_{50}$

Combined Model:

$TCONSB_{ij} = \gamma_{00} + \gamma_{01}*PINSLEAD_j$

$+ \gamma_{10}*YRSEXP_{ij}$

$+ \gamma_{20}*TSELEFFS_{ij}$

$+ \gamma_{30}*TCOOPS_{ij}$

$+ \gamma_{40}*CLASSSIZ_{ij}$

$+ \gamma_{50}*TIMETEAC_{ij}$

$+ u_{0j} + r_{ij}$

Model 3 – The Random Coefficient Model

This model contained the random effects and the random intercept.

Level 1: $TCONSB_{ij} = \beta_{0j} + \beta_{1j}*(YRSEXP_{ij}) + \beta_{2j}*(TSELEFFS_{ij}) + \beta_{3j}*(TCOOPS_{ij})$

$+ \beta_{4j}*(CLASSSIZ_{ij}) + \beta_{5j}*(TIMETEAC_{ij}) + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}*(PINSLEAD_j) + u_{0j}$

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + u_{2j}$

$\beta_{3j} = \gamma_{30} + u_{3j}$

$\beta_{4j} = \gamma_{40} + u_{4j}$

$\beta_{5j} = \gamma_{50} + u_{5j}$

Combined Model:

$TCONSB_{ij} = \gamma_{00} + \gamma_{01}*PINSLEAD_j$

$+ \gamma_{10}*YRSEXP_{ij}$

$+ \gamma_{20}*TSELEFFS_{ij}$

$+ \gamma_{30}*TCOOPS_{ij}$

$+ \gamma_{40}*CLASSSIZ_{ij}$

$+ \gamma_{50}*TIMETEAC_{ij}$

$+ u_{0j} + u_{1j}*YRSEXP_{ij} + u_{2j}*TSELEFFS_{ij} + u_{3j}*TCOOPS_{ij}$

$+ u_{4j}*CLASSSIZ_{ij} + u_{5j}*TIMETEAC_{ij} + r_{ij}$

Model 4 – The Full Random Coefficient Model

The full model contained all predictors with cross-level interactions

Level 1: $TCONSB_{ij} = \beta_{0j} + \beta_{1j}*(YRSEXP_{ij}) + \beta_{2j}*(TSELEFFS_{ij}) + \beta_{3j}*(TCOOPS_{ij})$

$+ \beta_{4j}*(CLASSSIZ_{ij}) + \beta_{5j}*(TIMETEAC_{ij}) + r_{ij}$

Level 2: $\beta_{0j} = \gamma_{00} + \gamma_{01}*(PINSLEAD_j) + u_{0j}$

$\beta_{1j} = \gamma_{10} + u_{1j}$

$\beta_{2j} = \gamma_{20} + \gamma_{21}*(PINSLEAD_j) + u_{2j}$

$\beta_{3j} = \gamma_{30} + \gamma_{31}*(PINSLEAD_j) + u_{3j}$

$\beta_{4j} = \gamma_{40} + u_{4j}$

$\beta_{5j} = \gamma_{50} + u_{5j}$

Combined Model:

$TCONSB_{ij} = \gamma_{00} + \gamma_{01}*PINSLEAD_j$

$+ \gamma_{10}*YRSEXP_{ij}$

$+ \gamma_{20}*TSELEFFS_{ij} + \gamma_{21}*PINSLEAD_j*TSELEFFS_{ij}$

$+ \gamma_{30}*TCOOPS_{ij} + \gamma_{31}*PINSLEAD_j*TCOOPS_{ij}$

$+ \gamma_{40}*CLASSSIZ_{ij}$

$+ \gamma_{50}*TIMETEAC_{ij}$

$+ u_{0j} + u_{1j}*YRSEXP_{ij} + u_{2j}*TSELEFFS_{ij} + u_{3j}*TCOOPS_{ij}$

$+ u_{4j}*CLASSSIZ_{ij} + u_{5j}*TIMETEAC_{ij} + r_{ij}$

Summary

This chapter outlined the methodology of this study. The following topics were discussed: research design, cross-national study issues, data source, samples, measurement scales, and data analysis. In the data analysis section, the author outlined the process required to answer the research questions and hypotheses of this study. Five competing models of HLM were proposed.

CHAPTER 4

Findings

The purpose of this study was to utilize an international data set of the Teaching and Learning International Study (TALIS) 2013 to investigate the relationships among teachers' constructivist beliefs, self-efficacy beliefs, professional activities, background and teaching information along with the school principals' instructional leadership, among lower secondary school teachers in South Korea, Finland, and Mexico.

The results are divided into three sections. The first section includes results from the descriptive statistics of the teacher- and principal-level measured variables. The teacher-level variables include constructivist beliefs (TCONSB), self-efficacy (TSELEFFS), teacher co-operation (TCOOPS), and teachers' background and teaching information, such as amount of working experience (YRSEXP), number of students enrolled in a target class (CLASSSIZ), and percentage of time spent on actual teaching (TIMETEAC). The principal-level variable includes principal instructional leadership (PINCLEADS). Additionally, the assumptions were also discussed in this section. The second section includes results from the assessment of the measurement models. This section reports on the factor loading, reliability, validity, and goodness-of-fit of the CFA measurement models. Finally, the third section presents the results from two-level hierarchical linear modeling analyses.

Descriptive Analysis

Cross-Country Comparisons

The missing data and the pattern of the missing-ness were examined using the Missing Value Analysis function in SPSS. The outputs indicated that 4.20% of the overall values in the South Korea data set, 1.71% of all values in the Finland data set, and 1.41% of all values in the

Mexico data set were missing. If LISTWISE deletion were employed, 9.27% of all cases in the South Korea data set, 6.39% of all cases in the Finland data set, and 13.93% of all cases in the Mexico data set would be excluded from the analysis. In this study, the missing values were treated using the maximum likelihood estimate (ML) via the EM algorithm.

Tables 4.1, 4.2, and 4.3 present the descriptive statistics of the key variables, including 27 teacher- and principal-level measuring items. The descriptive analysis as shown in Tables 4.2 and 4.3 was conducted by means of the IEA International Database Analyzer using weighted data to reflect the mean and standard deviation of the population. There were a total of 2,933 teachers in 177 schools in South Korea, 2,722 teachers in 145 schools in Finland, and 3,138 teachers in 187 schools in Mexico. The teacher respondents' ages ranged from 22 to 62 years with an average age of 43 years ($M = 42.50$, $SD = 9.13$) in South Korea, 19 to 67 with an average age of 44 years ($M = 44.04$, $SD = 10.07$) in Finland, and 19 to 75 with an average age of 42 years ($M = 42.34$, $SD = 10.07$) in Mexico. Teacher respondents in South Korea reported having an average of 16.58 years ($SD = 9.83$) of working experience as a teacher, while teacher respondents in Finland and Mexico reported having an average of 15.51 years ($SD = 9.64$) and 16.37 years ($SD = 9.65$), respectively. A Pearson's Product Moment Correlations analysis revealed significant positive correlations between the teacher respondents' ages and their amounts of working experience as teachers in all three countries (South Korea: $r = .929$, $p < .001$; Finland: $r = .864$, $p < .001$; Mexico: $r = .832$, $p < .001$.)

Table 4.1

Unweighted Descriptive Analysis for Key Variables

Variable (Unweighted)	Country	N	Mean	Std. Deviation	Min	Max
Level 1						
Constructivist Belief (TCONSB)	South Korea	2933	3.34	0.49	1	4
	Finland	2739	3.18	0.40	1	4
	Mexico	3138	3.29	0.52	1	4
Self-efficacy (TSELEFFS)	South Korea	2933	2.88	0.51	1	4
	Finland	2739	3.14	0.50	1	4
	Mexico	3138	3.29	0.46	2	4
Teacher co-operation (TCOOPS)	South Korea	2933	2.90	0.88	1	6
	Finland	2739	3.87	0.93	1	6
	Mexico	3138	3.47	1.06	1	6
Year(s) working as a teacher in total (YRSEXP)	South Korea	2933	16.58	9.83	1	40
	Finland	2739	15.48	9.63	0	42
	Mexico	3138	16.37	9.65	0	50
Number of students enrolled in class (CLASSSIZ)	South Korea	2933	32.65	6.75	1	90
	Finland	2739	17.42	7.73	1	95
	Mexico	3138	33.68	10.73	1	95
Percentage of actual teaching time (TIMETEAC)	South Korea	2933	77.10	14.82	0	100
	Finland	2739	80.73	12.48	10	100
	Mexico	3138	75.45	14.46	0	100
Level 2						
Principal's Instructional leadership (PINSLEAD)	South Korea	177	2.99	0.53	2	4
	Finland	145	2.45	0.52	1	4
	Mexico	187	3.17	0.59	2	4

Table 4.2

Descriptive Analysis of Level-1 Variables Using Teacher Weights

Scale	Item		Wording	South Korea (n = 75,056) Mean	Std. Dev.	Finland (n = 17,015) Mean	Std. Dev.	Mexico (n = 176,056) Mean	Std. Dev.
Constructivist Beliefs (TCONSB)	32A	Beliefs	My role as a teacher is to facilitate students' own inquiry	3.42	0.56	3.34	0.54	3.45	0.69
	32B	Beliefs	Students learn best by finding solutions to problems on their own	3.41	0.60	2.99	0.59	3.28	0.76
	32C	Beliefs	Students should be allowed to think of solutions themselves	3.41	0.56	3.21	0.54	3.48	0.65
	32D	Beliefs	Thinking and reasoning processes are more important	3.16	0.68	3.22	0.60	2.98	0.81
Self-efficacy (TSELEFFS)	34D	To what extent	Control disruptive behavior in the classroom	2.96	0.69	3.24	0.69	3.31	0.71
	34F	To what extent	Make my expectations about student behavior clear	2.84	0.67	3.41	0.63	3.26	0.68
	34H	To what extent	Get students to follow classroom rules	3.01	0.67	3.19	0.65	3.24	0.70
	34I	To what extent	Calm a student who is disruptive or noisy	2.91	0.70	3.04	0.73	3.14	0.75
	34C	To what extent	Craft good questions for my students	2.95	0.66	3.36	0.66	3.20	0.67
	34J	To what extent	Use a variety of assessment strategies	2.79	0.67	2.83	0.75	3.18	0.69
	34K	To what extent	Provide an alternative explanation	3.03	0.66	3.05	0.72	3.40	0.61
	34L	To what extend	Implement alternative instructional strategies	2.75	0.71	2.93	0.78	3.26	0.67
	34A	To what extent	Get students to believe they can do well in school work	2.98	0.66	3.18	0.69	3.31	0.70
	34B	To what extent	Help my students value learning	2.99	0.67	3.08	0.73	3.38	0.65
	34E	To what extent	Motivate students who show low interest in school work	2.70	0.72	2.81	0.78	3.12	0.85
	34G	To what extent	Help students think critically	2.75	0.69	2.98	0.74	3.32	0.67

Teacher co-operation (TCOOPS)	33A	Frequently	Teach jointly as a team in the same class	2.55	1.60	2.96	1.88	4.52	1.85
	33B	Frequently	Observe other teachers' classes and provide feedback	2.66	0.85	1.57	1.12	2.13	1.56
	33C	Frequently	Engage in joint activities across different classes and age groups	1.83	1.10	2.48	1.25	2.89	1.59
	33H	Frequently	Take part in collaborative professional learning	2.43	1.24	2.08	1.18	3.54	1.34
	33D	Frequently	Exchange teaching materials with colleagues	3.44	1.38	3.82	1.53	3.57	1.52
	33E	Frequently	Engage in discussions about the learning development of specific students	2.59	1.38	5.24	1.06	3.68	1.42
	33F	Frequently	Work with teachers to ensure common standards for assessing student progress	2.88	1.14	3.91	1.55	3.38	1.54
	33G	Frequently	Attend team conferences	3.28	1.36	4.18	1.45	3.90	1.23

Table 4.3

Descriptive Analysis of Level-2 Variable Using School Weights

				South Korea (n = 707)		**Finland (n = 2,824)**		**Mexico (n = 14,399)**	
Scale	**Item**	**Wording**		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Principal's Instructional Leadership (PINSLEADS)	21C	Frequently	Engage in - supporting co-operation among teachers	2.95	0.70	2.58	0.58	2.93	0.72
	21D	Frequently	Engage in - teachers responsibility for improving teaching skills	2.97	0.65	2.32	0.71	3.04	0.76
	21E	Frequently	Engage in - teachers responsibility for learning outcomes	3.06	0.72	2.41	0.75	3.24	0.68

Teacher respondents in South Korea reported spending an average of 37.05 hours (SD = 16.99) on teaching and other tasks related to their job per week. They had an average class size of 33 students (SD = 7). Typically, they spent 77% of their teaching time on actual teaching and learning, 13% on keeping order in the class, and 8% on administrative tasks. Teacher respondents in Finland reported spending an average of 31.11 hours (SD = 12.28) on teaching and other tasks related to their job per week. They had an average class size of 17 students (SD = 8). Typically, they spent 81% of their teaching time on actual teaching and learning, 13% on keeping order in the class, and 6% on administrative tasks. Teacher respondents in Mexico reported spending an average of 33.48 hours (SD = 19.15) on teaching and other tasks related to their job per week. They had an average class size of 34 students (SD = 11). Typically, they spent 75% of their teaching time on actual teaching and learning, 12% on keeping order in the class, and 12% on administrative tasks.

Figure 4.1 presents the percentage of teachers who report never engaging in particular teacher co-operation activities. Of all respondents, 70% of the lower secondary education teachers in Finland and 50% in Mexico reported never having observed other teachers' classes or provided feedback. By contrast, 49% of the teachers in South Korea reported that they observed other teachers' classes and provided feedback 2-4 times a year. Interestingly, 50% of the teachers in South Korea reported never having engaged in joint activities across different classes and age groups, while 32% of teachers in Finland engaged in joint activities up to 2-4 times a year.

In this study, the constructed latent variables were the combination of multiple measurement items. For example, the instructional leadership construct was developed using 3 single items: TC2G21C, TC2G21D, and TC2G21E. Table 4.4 indicates the composite scores of each construct, which were the average of the measurement items of a given construct.

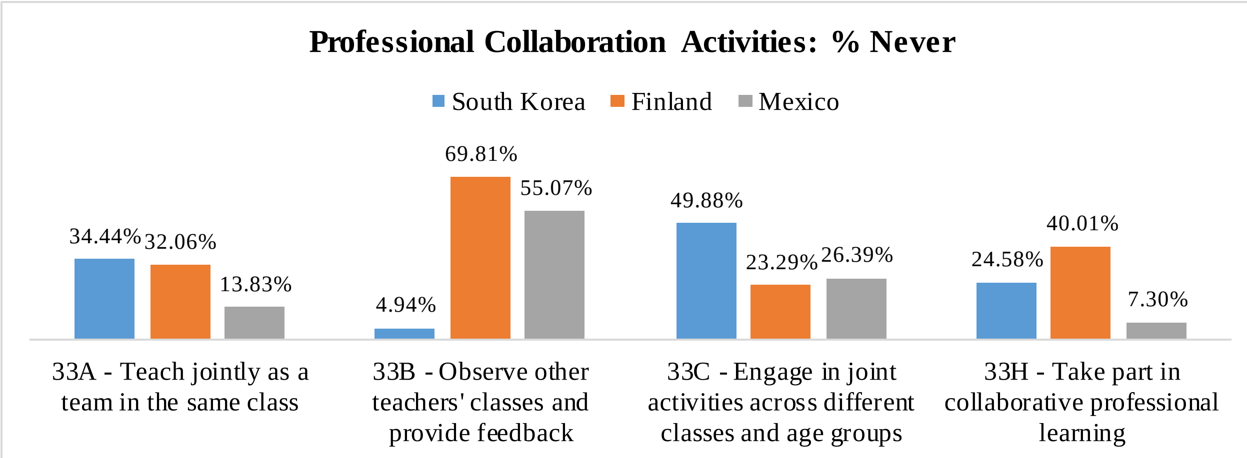

Figure 4.1. Percentage of Teachers Who Report Never Engaging in the Professional Collaboration Activities

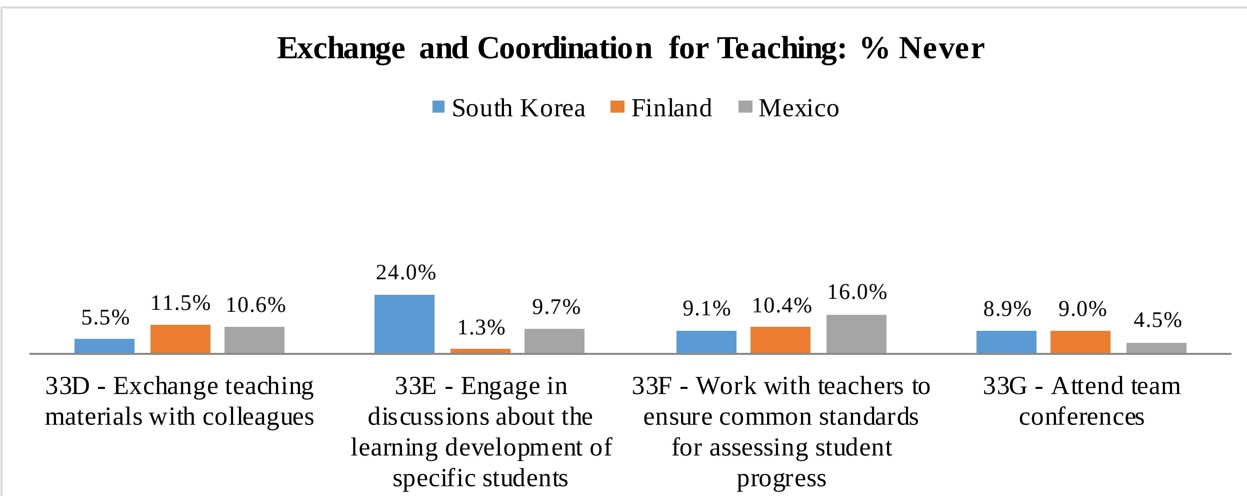

Figure 4.2. Percentage of Teachers Who Report Never Engaging in the Exchange and Coordination for Teaching Activities

Next, the continuous scales were inspected. Based on the outputs, all of the skewness values are less than 2, and the kurtosis values are less than 7, indicating that the assumption of normality holds, as suggested by West, Finch and Curran (1995). The assumption of linearity was also examined using the lack of fit test. All of the p-values are greater than the alpha level of significance of 0.05, which indicates a failure to reject to the null hypothesis that the relationship is linear. Hence, the assumption of linearity was satisfied.

The assumption of dependency was examined through the intraclass correlation coefficient (ICC), which indicates the degree of clustering by determining whether teachers within schools are more similar on the outcome than teachers between schools. Table 4.4 presents the ICC values. The obtained ICC values indicated that less than one percent of the variance of the constructivist beliefs could be explained by school in South Korea, while the design effect was equal to 1.02. In Finland, the ICC was 2.9% with a design effect of 1.51, indicating that schools accounted for 2.9% of variance in constructivist beliefs. In Mexico, the ICC was 1.8% with a design effect of 1.28; thus, schools accounted for 1.8% of variance in teachers' constructivist beliefs. The general rule is that any design effect that is larger than 2 indicates that the amount of variance between groups accounts for a significant amount of the total variance. There is no firm guideline on what size of ICC coefficient would warrant multilevel analysis. According to Hox's (2002) guideline, an ICC value that is less than .05 is considered small, 0.10 is medium, and 0.15 is large. If the ICC is close to zero, Wang et al. (2013) stated that an OLS regression analysis at the micro-level (e.g., for teachers) would be adequate since there is no clustering effect and the scores are independent of one another. Nevertheless, researchers have stated that a non-significant ICC does not rule out the need for a random coefficient model (Garson, 2012; Nezlek, 2008). Ignoring the clustering effect because of a non-significant ICC would be dangerous since ICC tests for difference in the intercept of the dependent variables among groups, and if no substantial variance between groups in a measure is found, this does not imply that there is no difference in the slopes of the predictors. Relationships between measures may be different in other groups (Garson, 2012; Nezlek, 2008). Overall, there are advantages in using multilevel analysis even with a close-to-zero ICC (Hayes, 2006).

Measurement Model Assessment

To check whether the hypothesized construct held true for the sample, confirmatory factor analyses (CFA) were performed. Since the ICC in this study is very small, a disaggregated single-level CFA would still provide accurate estimates and SEs of standardized estimates. These results also produced the criteria for convergent and discriminant validity (Hair et al., 2010).

In the initial model, the constructivist beliefs (TCONSB) construct was developed from four items (32A, 32B, 32C, 32D), and the self-efficacy (TSELEFFS) construct was created from twelve items: four items from self-efficacy in classroom management (34D, 34F, 34H, 34I), four items from self-efficacy in instruction (34C, 34J, 34K, 34L), and four items from self-efficacy in student engagement (34A, 34B, 34E, 34G). The teacher co-operation (TCOOPS) construct was developed from the four items of professional collaboration (33A, 33B, 33C. 33H) and the four items from the exchange and coordination for teaching construct (33D, 33E, 33F, 33G). The principal instructional leadership construct was created from three items (21C, 21D, 21E).

To modify the model, the observed variable that had produced low factor loading was eliminated. The modification indices were consulted for the model modification. Tables 4.4 presents the list of final measuring items for each construct. The model fit indices that were consulted include the comparative fit index (CFI), the goodness of fit index (GFI), the adjusted goodness-of-fit indices (AGFI), the root mean squared errors of approximation (RMSEA), and the standardized root mean square residual (SRMR) (Hair et al., 2010). The models were considered acceptable if CFI $\geq$ 0.90, GFI $\geq$ 0.90, AGFI $\geq$ 0.90, RMSEA $\leq$ 0.08, and SRMR $\leq$ 0.10 (Joreskog & Sorbom, 1993; Hu & Bentler, 1999; Kline, 2005.) Table 4.5 presents the model fit indices. Based on the outputs, all models fit well with the given data set and were valid and acceptable for measurement.

Reliability

The composite reliability of each construct ranged from 0.675 - 0.925. Any value that is greater than 0.50 provides good evidence for composite reliability (Hair et al., 2010). Hence, the reliability of the constructs was achieved.

Convergent and Discriminant Validity

Convergent validity was examined from the construct reliability (CR) and the Average Variance Extract (AVE) of each construct. All of the composite reliabilities, ranging from 0.675-0.925, indicated adequate to good reliability. The general guideline for the AVE is that the AVE should be equal to or larger than 0.5 to suggest adequate convergent validity. Based on the outputs, the AVE of TCONSB of the Finland (0.478) and Mexico (0.376) measurement models, TSELEFFS (Finland, 0.442; Mexico, 0.400), and TCOOPS (South Korea, 0.475; Finland, 0.475) do not meet the acceptable cut-off point. However, all of the AVE estimates are greater than the squared inter-construct correlation estimate (SIC), indicating that the measurement items have more in common with the hypothesized construct than they do with other constructs. Overall, the constructs demonstrated sufficient presence of convergent validity and excellent discriminant validity (See Tables 4.6, 4.7, and 4.8)

Table 4.4

Descriptive Statistics, Composite Reliability, and ICC of Key variables

Construct	Composite Reliability		Measuring Items	ICC coefficient	
Constructivist beliefs (TCONSB)	South Korea	0.851	4 - 32a,b,c,d	0.002	Small
	Finland	0.675	4 - 32a,b,c,d	0.029	Small
	Mexico	0.700	4 - 32a,b,c,d	0.018	Small
Teacher's self-efficacy (TSELEFFS)	South Korea	0.925	10 - 34b,c,d,e,f,g,h,j,k,l	0.025	Small
	Finland	0.862	8 - 34b,c,d,e,f,h,i,k	0.020	Small
	Mexico	0.822	7 - 34b,c,f,g,j,k,l	0.026	Small
Teacher's co-operation (TCOOPS)	South Korea	0.818	6 - 33b,d,e,f,g,h	0.073	Medium
	Finland	0.690	5 - 33c,d,e,f,g	0.093	Medium
	Mexico	0.848	6 - 33c,d,e,f,g,h	0.119	Large
Instructional leadership (PINSLEADS)	South Korea	0.758	3 - 21c,d,e	-	-
	Finland	0.703	3 - 21c,d,e	-	-
	Mexico	0.799	3 - 21c,d,e	-	-

Table 4.5

Model Fit Indices

	CFI	GFI	AGFI	RMSEA	SRMR
Acceptable if	*≥ .900*	*≥ .900*	*≥ .900*	*< .080*	*≤ .100*
South Korea	.937	.936	.921	.054	.033
Finland	.898	.939	.923	.055	.045
Mexico	.967	.974	.967	.035	.030

Table 4.6

Average Variance Extract and Discriminant Validity – South Korea

South Korea	TCONSB	TSELEFFS	TCOOPS	PINSLEADS
TCONSB	**0.591**			
TSELEFFS	0.058	**0.552**		
TCOOPS	0.025	0.092	**0.475**	
PINSLEADS	0.003	0.001	0.007	**0.522**

Note: in the diagonal-running cells, the average variance extracted (AVE) is in bold; the lower-left half of the table shows the squared inter-construct correlation estimates (SIC).

Table 4.7

Average Variance Extract and Discriminant Validity – Finland

Finland	TCONSB	TSELEFFS	TCOOPS	PINSLEADS
TCONSB	**0.478**			
TSELEFFS	0.044	**0.442**		
TCOOPS	0.004	0.071	**0.475**	
PINSLEADS	0.008	0.001	0.002	**0.522**

Note: in the diagonal-running cells, the average variance extracted (AVE) is in bold; the lower-left half of the table shows the squared inter-construct correlation estimates (SIC).

Table 4.8

Average Variance Extract and Discriminant Validity – Mexico

Mexico	TCONSB	TSELEFFS	TCOOPS	PINSLEADS
TCONSB	**0.376**			
TSELEFFS	0.040	**0.400**		
TCOOPS	0.004	0.114	**0.584**	
PINSLEADS	0.002	0.001	0.003	**0.578**

Note: in the diagonal-running cells, the average variance extracted (AVE) is in bold; the lower-left half of the table shows the squared inter-construct correlation estimates (SIC).

Table 4.9

HLM Results - South Korea

South Korea	Null Model				Model 2				**Model 3**				Model 4			
Fixed Effect	Coefficient	Standard error	*t* -ratio	*p* -value	Coefficient	Standard error	*t* -ratio	*p* -value	Coefficient	Standard error	*t* -ratio	*p* -value	Coefficient	Standard error	*t* -ratio	*p* -value
For INTRCPT1, β_0																
INTRCPT2, γ_{00}	3.3572	0.0109	308.1450	<0.001	3.3607	0.0103	326.4370	<0.001	3.3594	0.0106	318.3770	<0.001	3.3599	0.0106	318.4050	<0.001
PINSLEAD, γ_{01}	-	-	-	-	0.0257	0.0202	1.2720	0.2050	0.0268	0.0208	1.2890	0.1990	0.0248	0.0206	1.2010	0.2310
For YRSEXP slope, β_1																
INTRCPT2, γ_{10}	-	-	-	-	-0.0017	0.0011	-1.6080	0.1080	-0.0016	0.0011	-1.4920	0.1370	-0.0016	0.0011	-1.4380	0.1520
For TSELEFFS slope, β_2																
INTRCPT2, γ_{20}	-	-	-	-	0.1808	0.0217	8.3460	<0.001	0.1783	0.0255	6.9920	**<0.001**	0.1786	0.0254	7.0230	<0.001
PINSLEAD, γ_{21}	-	-	-	-	-	-	-	-	-	-	-	-	-0.0056	0.0500	-0.1120	0.9110
For TCOOPS slope, β_3																
INTRCPT2, γ_{30}	-	-	-	-	0.0406	0.0125	3.2470	0.0010	0.0365	0.0144	2.5260	**0.0120**	0.0371	0.0144	2.5790	0.0110
PINSLEAD, γ_{31}	-	-	-	-	-	-	-	-	-	-	-	-	-0.0481	0.0277	-1.7390	0.0840
For CLASSSIZ slope, β_4																
INTRCPT2, γ_{40}	-	-	-	-	-0.0001	0.0016	-0.0670	0.9470	-0.0005	0.0017	-0.3160	0.7520	-0.0005	0.0017	-0.2970	0.7670
For TIMETEAC slope, β_5																
INTRCPT2, γ_{50}	-	-	-	-	0.0017	0.0007	2.3850	0.0170	0.0014	0.0009	1.5720	0.1180	0.0015	0.0009	1.6980	0.0910
Random Effect		Variance Component	χ^2	*p* -value		Variance Component	$\chi2$	p-value		Variance Component	$\chi2$	p-value		Variance Component	χ^2	*p* -value
INTRCPT1, u_0		0.0004	191.4284	0.2020		0.0000	178.5485	0.4110		0.0007	185.5679	0.2430		0.0007	185.5668	0.2430
YRSEXP slope, u_1		-	-	-		-	-	-		0.0000	205.4071	0.0520		0.0000	205.4378	0.0520
TSELEFFS slope, u_2		-	-	-		-	-	-		0.0205	198.3913	0.0990		0.0204	197.8797	0.0950
TCOOPS slope, u_3		-	-	-		-	-	-		0.0057	281.2364	<0.001		0.0056	277.8931	<0.001
CLASSSIZ slope, u_4		-	-	-		-	-	-		0.0000	171.2318	>0.500		0.0000	171.1377	>0.500
TIMETEAC slope, u_5		-	-	-		-	-	-		0.0000	266.9844	<0.001		0.0000	266.7680	<0.001
level-1, r		0.2373	-	-		0.2244	-	-		0.2061	-	-		0.2061	-	-
Criteria fit																
Deviance				4107.6958				3939.6583				3894.5034				3889.67
# estimated parameters				3				9				29				31.00
AIC				4113.70				3957.66				3952.50				3951.67
BIC				4131.65				4011.51				4126.03				4137.17

Table 4.10

HLM Results – Finland

Finland	Null Model				**Model 2**				Model 3				Model 4			
Fixed Effect	Coefficient	Standard error	*t* -ratio	*p* -value	Coefficient	Standard error	*t* -ratio	*p* -value	Coefficient	Standard error	*t* -ratio	*p* -value	Coefficient	Standard error	*t* -ratio	*p* -value
For INTRCPT1, β_0																
INTRCPT2, γ_{00}	3.1831	0.0097	328.7930	<0.001	3.1829	0.0092	344.3520	<0.001	3.1830	0.0090	354.0840	<0.001	3.1828	0.0090	354.7000	<0.001
PINSLEAD, γ_{01}	-	-	-	-	0.0112	0.0175	0.6420	0.5220	0.0075	0.0169	0.4410	0.6600	0.0091	0.0169	0.5340	0.5940
For YRSEXP slope, β_1																
INTRCPT2, γ_{10}	-	-	-	-	-0.0024	0.0008	-2.9790	**0.0030**	-0.0025	0.0008	-2.9900	0.0030	-0.0025	0.0008	-3.0580	0.0030
For TSELEFFS slope, β_2																
INTRCPT2, γ_{20}	-	-	-	-	0.1624	0.0159	10.2060	**<0.001**	0.1578	0.0184	8.5640	<0.001	0.1574	0.0184	8.5630	<0.001
PINSLEAD, γ_{21}	-	-	-	-	-	-	-	-	-	-	-	-	0.0038	0.0341	0.1100	0.9120
For TCOOPS slope, β_3																
INTRCPT2, γ_{30}	-	-	-	-	0.0242	0.0086	2.7990	**0.0050**	0.0225	0.0096	2.3520	0.0200	0.0224	0.0095	2.3620	0.0200
PINSLEAD, γ_{31}	-	-	-	-	-	-	-	-	-	-	-	-	0.0352	0.0180	1.9520	0.0530
For CLASSSIZ slope, β_4																
INTRCPT2, γ_{40}	-	-	-	-	-0.0013	0.0010	-1.2650	0.2060	-0.0010	0.0011	-0.9260	0.3560	-0.0010	0.0011	-0.9340	0.3520
For TIMETEAC slope, β_5																
INTRCPT2, γ_{50}	-	-	-	-	-0.0009	0.0006	-1.4430	0.1490	-0.0009	0.0006	-1.3300	0.1860	-0.0008	0.0006	-1.2590	0.2100
Random Effect		Variance Component	χ^2	*p* -value		Variance Component	χ2	p-value		Variance Component	χ2	p-value		Variance Component	χ^2	*p* -value
INTRCPT1, u_0		0.0046	228.9337	<0.001		0.0039	220.5164	<0.001		0.0032	174.5820	0.0330		0.0031	174.6060	0.0320
YRSEXP slope, u_1		-	-	-		-	-	-		0.0000	160.4041	0.1520		0.0000	160.3207	0.1530
TSELEFFS slope, u_2		-	-	-		-	-	-		0.0119	185.7439	0.0090		0.0117	185.6366	0.0080
TCOOPS slope, u_3		-	-	-		-	-	-		0.0024	185.0428	0.0100		0.0022	182.8683	0.0120
CLASSSIZ slope, u_4		-	-	-		-	-	-		0.0000	129.4153	>0.500		0.0000	129.4062	>0.500
TIMETEAC slope, u_5		-	-	-		-	-	-		0.0000	147.0184	0.3920		0.0000	146.8171	0.3960
level-1, r		0.1553	-	-		0.1476	-	-		0.1414	-	-		0.1414	-	-
Criteria fit																
Deviance				2718.2539				2574.5106				2551.7929				2547.56
# estimated parameters				3				9				29				31.00
AIC				2724.25				2592.51				2609.79				2609.56
BIC				2741.98				2645.69				2781.16				2792.74

Table 4.11

HLM Results – Mexico

Mexico	Null Model				Model 2				Model 3				**Model 4**			
Fixed Effect	Coefficient	Standard error	*t* -ratio	*p* -value	Coefficient	Standard error	*t* -ratio	*p* -value	Coefficient	Standard error	*t* -ratio	*p* -value	Coefficient	Standard error	*t* -ratio	*p* -value
For INTRCPT1, β_0																
INTRCPT2, γ_{00}	3.3017	0.0122	270.2360	<0.001	3.3008	0.0121	273.1880	<0.001	3.2966	0.0121	271.7990	<0.001	3.2962	0.0120	273.8910	<0.001
PINSLEAD, γ_{01}	-	-	-	-	-0.0258	0.0206	-1.2550	0.2110	-0.0233	0.0206	-1.1330	0.2590	-0.0276	0.0204	-1.3500	0.1790
For YRSEXP slope, β_1																
INTRCPT2, γ_{10}	-	-	-	-	0.0037	0.0011	3.3250	<0.001	0.0036	0.0011	3.2480	0.0010	0.0037	0.0011	3.2740	**0.0010**
For TSELEFFS slope, β_2																
INTRCPT2, γ_{20}	-	-	-	-	0.1750	0.0241	7.2670	<0.001	0.1735	0.0264	6.5770	<0.001	0.1730	0.0256	6.7460	**<0.001**
PINSLEAD, γ_{21}	-	-	-	-	-	-	-	-	-	-	-	-	-0.1261	0.0435	-2.8990	**0.0040**
For TCOOPS slope, β_3																
INTRCPT2, γ_{30}	-	-	-	-	0.0108	0.0105	1.0300	0.3030	0.0125	0.0112	1.1170	0.2650	0.0134	0.0111	1.2110	0.2280
PINSLEAD, γ_{31}	-	-	-	-	-	-	-	-	-	-	-	-	0.0254	0.0188	1.3540	0.1770
For CLASSSIZ slope, β_4																
INTRCPT2, γ_{40}	-	-	-	-	-0.0009	0.0010	-0.8310	0.4060	-0.0004	0.0012	-0.3330	0.7390	-0.0004	0.0012	-0.3490	0.7280
For TIMETEAC slope, β_5																
INTRCPT2, γ_{50}	-	-	-	-	0.0014	0.0007	1.9160	0.0550	0.0014	0.0008	1.7520	0.0810	0.0014	0.0008	1.8040	0.0730
Random Effect		Variance Component	χ^2	*p* -value		Variance Component	$\chi2$	p-value		Variance Component	$\chi2$	p-value		Variance Component	χ^2	*p* -value
INTRCPT1, u_0		0.0049	276.6099	<0.001		0.0050	280.8832	<0.001		0.0041	244.2487	0.0010		0.0040	244.0217	0.0010
YRSEXP slope, u_1		-	-	-		-	-	-		0.0000	211.3850	0.0600		0.0000	211.0907	0.0620
TSELEFFS slope, u_2		-	-	-		-	-	-		0.0161	247.3362	<0.001		0.0118	244.1260	0.0010
TCOOPS slope, u_3		-	-	-		-	-	-		0.0022	289.3122	<0.001		0.0020	286.2851	<0.001
CLASSSIZ slope, u_4		-	-	-		-	-	-		0.0001	224.4887	0.0150		0.0001	224.2527	0.0160
TIMETEAC slope, u_5		-	-	-		-	-	-		0.0000	184.9445	0.4050		0.0000	184.7999	0.4080
level-1, r		0.2640	-	-		0.2543	-	-		0.2416	-	-		0.2419	-	-
Criteria fit																
Deviance				4781.1048				4667.4474				4638.2329				4627.53
# estimated parameters				3				9				29				31.00
AIC				4787.10				4685.45				4696.23				4689.53
BIC				4805.26				4739.91				4871.72				4877.13

Hierarchical Linear Modeling and Hypothesis Testing

Four competing models were analyzed in order to test the hypotheses. All predictors were centered on the grand mean. These models indicated that both teacher- and principal-related factors could explain variation in teachers' constructivist beliefs. The four models include 1) the null model, 2) the random-intercept model with level-1 and level-2 predictors, 3) the random coefficient model, and 4) the full random coefficient model.

Model 1: The null model as a baseline for model fit

The purpose of this model was to estimate the variance of constructivist beliefs within and between schools. At the teacher level, constructivist belief was predicted by only the intercept and a random term, where the intercept was modeled as a random effect. This model also worked as a baseline for model comparison.

Research Question 1: What are the teachers' levels of constructivist instructional beliefs?

Research Question 2: Do the constructivist beliefs vary across schools?

To answer research questions 1 and 2, the null model was investigated for each country. The results show that there were substantial variances that could be explained by the school-level predictors in Finland and Mexico. The significant Chi-square (Finland: $\chi^2 = 228.93$, $df = 176$, $p < .001$; Mexico: $\chi^2 = 276.61$, $df = 186$, $p < .001$) indicated that there was a significant variability in teachers' constructivist beliefs among schools that has yet to be explained.

In South Korea, the grand mean of teachers' constructivist beliefs was $\gamma_{00} = 3.357$ (standard error = 0.011) across all schools when other variables are controlled at zero. The non-significant Chi-square indicates that the error term associated with estimating the value of the intercept was not different from zero; hence, schools in South Korea did not differ significantly in terms of their average teachers' constructivist beliefs. In Finland, the grand mean of teachers' constructivist beliefs was γ_{00} = 3.183 (standard error = 0.010) across all schools when other variables are controlled at zero. The ICC was 0.0046/(0.0046+0.1553) = 0.029, indicating that about 3% of the variance in teachers' constructivist belief occurred between schools. In Mexico, the grand mean of teachers' constructivist beliefs was γ_{00} = 3.302 (standard error = 0.012) across all schools when other variables are controlled at zero. The ICC was 0.0049/(0.0049+0.2640) = 0.018, indicating that schools accounted for about 2% of the variability in teachers' constructivist beliefs. In conclusion, the greatest part of the variation in lower secondary education teachers' constructivist beliefs in South Korea, Finland, and Mexico was seen at the teacher level, not at the school level.

Model Selection

South Korea

Although model 4 provided the smallest AIC and BIC, model 3 was selected for the purpose of testing the hypotheses. The model comparison test was conducted, and it was found that the difference in the deviance statistics and number of parameters between model 3 and model 4 was non-significant ($\chi 2 = 4.83$, $df = 2$, $p < .09$), indicating that there is no substantial difference between the two competing models. Additionally, the results from model 4 would not provide more information in the analysis. As a result, the more parsimonious model was favored. The equation of model 3 is:

TCONSBij = 3.359 + 0.027*PINSLEADj + (-0.002)*YRSEXPij + 0.178*TSELEFFSij + 0.037*TCOOPSij + (-0.0005)*CLASSSIZij + 0.001*TIMETEACij

Residual (rij) = 0.210

Intercept variance (u0j) = <0.001

Variance in YRSEXP slope = <0.001

Variance in TSELEFFS slope = 0.020

Variance in TCOOPS slope = 0.005

Variance in CLASSSIZ slope = <0.001

Variance in TIMETEAC slope = <0.001

Finland

The AIC and the BIC provided strong evidence for favoring model 2. Additional parameters added to model 3 did not improve the model fit. Hence, the more parsimonious model was selected. The equation for model 2 is

TCONSBij = 3.183 + 0.011*PINSLEADj + (-0.002)*YRSEXPij + 0.162*TSELEFFSij + 0.024*TCOOPSij + (-0.001)*CLASSSIZij + (-0.001)*TIMETEACij

Residual (rij) = 0.148

Intercept variance (u0j) = 0.004

Mexico

The AIC was smallest in model 4, while the BIC was smallest in model 3. Based on the chi-square difference test, it was found that there was no substantial difference – the two models fit the data equally well. Generally, the AIC tends to favor the more complex model with more parameters, while the BIC tends to favor the more parsimonious model (O'Connell & McCoach, 2008). Considering the theoretical issue, the model was constructed with an aim to testing the cross-level interaction, which is an additional parameter in model 4. As a result, the more complex model was favored in this case. The equation for model 4 is

TCONSBij = 3.296 + (-0.028)*PINSLEADj + 0.004*YRSEXPij + 0.173*TSELEFFSij + (-0.126)*PINSLEADj*TSELEFFSij + 0.013*TCOOPSij + 0.025*PINSLEADj*TCOOPSij + (-0.0004)*CLASSSIZij+ 0.001*TIMETEACij

Residual (rij) = 0.242

Intercept variance (u0j) = 0.004

Variance in YRSEXP slope = <0.001

Variance in TSELEFFS slope = 0.012

Variance in TCOOPS slope = 0.002

Variance in CLASSSIZ slope = <0.001

Variance in TIMETEAC slope = <0.001

Hypothesis Testing

The selected model was used to test the following hypotheses:

H1: Constructivism will vary among the schools.

H2: Principal instructional leadership will have a positive direct effect on teacher constructivist beliefs.

H3a: Teachers' self-efficacy will have a direct effect on teacher constructivist beliefs.

H3b: The effect of teachers' self-efficacy will vary among the schools.

H4a: Teacher co-operation will have a direct positive effect on teacher constructivist beliefs.

H4b: The effect of teacher co-operation will vary among schools.

H5a: Amount of experience will have a direct effect on teacher constructivist beliefs.

H5b: The effect of amount of experience will vary among schools.

H6a: Class size will have a direct effect on teacher constructivist beliefs.

H6b: The effect of class size will vary among schools.

H7a: Percentage of time teaching time will have a direct effect on teacher constructivist beliefs.

H7b: The effect of percentage of teaching time will vary among schools.

H8a: The relationship between self-efficacy and teacher constructivist beliefs will be moderated by principals' instructional leadership.

H8b: The relationship between teacher co-operation and teacher constructivist beliefs will be moderated by principals' instructional leadership.

South Korea

The HLM results for South Korea have been presented in Table 4.9. Model 3, the selected model, contains all level-1 and level-2 variables with the cross-level interactions as the fixed effects and five random slopes of all variables. The estimate for the grand mean was γ_{00} = 3.359 ($p < 0.001$). In model 3, hypotheses 1 and 2 depend on the results at the school level, while hypotheses 3, 4, 5, and 6 relate to the results at the teacher level. Hypotheses 3b, 4b, 5b, 6a, and 6b were proposed to explain the variation among schools. Model 3 excluded the cross-level interaction effects. Hence, hypotheses 6a and 6b were both rejected.

H1: Constructivism will vary among the schools.

The findings from the model suggested that schools in South Korea did not differ significantly in terms of their average teachers' constructivist beliefs. The amount of variation in teachers' constructivist beliefs between schools is extremely small. The estimation of variance components from full maximum likelihood for teachers' constructivist beliefs are $\sigma^2 = 0.206$ at the teacher level and $\tau_{00} = 0.001$ ($p = 0.243$) at the school level. Hence, hypothesis 1 was not supported.

The ICC was 0.0004/(0.0004+0.2373) = 0.0017, indicating that schools account for less than one percent of the variability in teachers' constructivist beliefs. Most of the variation was found between teachers. Thus, school and principal characteristics have an extremely small effect on teachers' constructivist beliefs. As a result of examination of the residual variance (level-1, r), which is a variance associated with the within-school variation in teachers' constructivist beliefs (TCONSB) and not accounted for by random effects of school on the intercept of TCONSB and on the slopes of YRSEXP, TSELEFFS, TCOOPS, CLASSSIZ, and TIMETEAC, the residual component dropped from 0.2373 (null model) to 0.2061 (model 3). The proportion of variance explained at the teacher level compared to the null model was (0.2373-0.2061)/0.2373 = 0.1318. Variables in model 3, including YRSEXP, TSELEFFS, TCOOPS, CLASSSIZ, and TIMETEAC, explained up to 13.18% of the variance in teachers' constructivist beliefs.

H2: Principal instructional leadership will have a positive direct effect on teacher constructivist beliefs.

H3a: Teachers' self-efficacy will have a direct effect on teacher constructivist beliefs.

H4a: Teacher co-operation will have a direct positive effect on teacher constructivist beliefs.

H5a, H6a, and H7a: Teachers' background will have a direct effect on teacher constructivist beliefs.

There was no statistically significant effect of the principal instructional leadership (PINSLEAD) at the school level on the teachers' constructivist belief (γ_{01} = 0.0268, p = 0.199). Hence, hypothesis 2 was not supported. Teachers' self-efficacy (TSELEFFS) and teacher co-operation (TCOOPS) were found to have significant positive relationship with teachers' constructivist beliefs (TCONSB) (TSELEFFS: γ_{20} =0.1783, p <0.001; TCOOPS: γ_{30} = 0.0365, p = 0.012). The fact that these coefficients were positive means that the higher the level of teachers' self-efficacy and teacher co-operation, the higher the predicted teachers' constructivist beliefs, controlling other variables in the model. Hence, hypotheses 3a and 4a were supported. Teachers' background, such as amount of work experience in teaching (YRSEXP), class size (CLASSIZ), and percentage of time spent on actual teaching (TIMETEAC) did not directly affect the teachers' constructivist beliefs (γ_{10} = -0.0016, p = 0.137; γ_{40} = -0.0001, p = 0.752; γ_{50} = 0.0014, p = 0.118). Hence, hypotheses 5a, 6a, and 7a were not supported.

H3b: The effect of teachers' self-efficacy will vary among schools.

H4b: The effect of teacher co-operation will vary among schools.

H5b, H6b, and H7b: The effect of teachers' background will vary among schools.

The random effect of school on the slopes of teacher co-operation (TCOOPS slope, u3) and percentage of time spent on actual teaching (TIMETEAC slope, u5) was statistically significant. Hence, hypotheses 3b and 7b were supported. The significant chi-square tests ($p <.001$) indicated that the hypothesis that there is no difference in slopes of TCOOPS and TIMETEAC among schools was rejected.

Finland

The HLM results for Finland have been presented in Table 4.10. Model 2, the selected model, contains all level-1 and level-2 variables with no cross-level interactions. Additionally, the slopes of all predictors were not varied across schools. The estimate for the grand mean was γ_{00} = 3.183 ($p <0.001$). Since model 3 excluded the cross-level interaction effects and the random slope effects, hypotheses 3b, 4b, 5b, 6b, 7b, 8a, and 8b were all rejected.

H1: Constructivism will vary among the schools.

The results suggested that schools in Finland differed significantly in terms of their average teachers' constructivist beliefs. The estimation of variance components for teachers' constructivist beliefs are $\sigma^2 = 0.1476$ at the teacher level and $\tau_{00} = 0.004$ ($p<.001$) at the school level. Hence, hypothesis 1 was supported.

The ICC was 0.0046/(0.0046+0.1553) = 0.029, indicating that schools accounted for 3% of the variance in teachers' constructivist beliefs. Similarly to the case in South Korea, most of the variation was found between teachers. Predictors at level 2, such as principal characteristics, had small or no effect on teachers' constructivist beliefs. As a result of an examination of the residual variance (level-1, r), the residual component dropped from 0.1553 (the null model) to 0.1478 (model 2). The proportion of variance explained at the teacher level compared to the null model was (0.1553-0.1476)/0.1553 = 0.0496. Variables in model 2, including YRSEXP, TSELEFFS, TCOOPS, CLASSSIZ, and TIMETEAC, explained up to 5% of the variance in teachers' constructivist beliefs.

H2: Principal instructional leadership will have a positive direct effect on teacher constructivist beliefs.

H3a: Teachers' self-efficacy will have a direct effect on teacher constructivist beliefs.

H4a: Teacher co-operation will have a direct positive effect on teacher constructivist beliefs.

H5a, H6a, and H7a: Teachers' background will have a direct effect on teacher constructivist beliefs.

Consistent with the results from South Korea, there was no statistically significant effect of the principal instructional leadership (PINSLEAD) at the school level on the teachers' constructivist belief ($\gamma_{01} = 0.0112$, $p = 0.522$). Hence, hypothesis 2 was not supported. Additionally, teachers' self-efficacy (TSELEFFS) and teacher co-operation (TCOOPS) were shown to have a significant positive relationship with teachers' constructivist beliefs (TCONSB)

(TSELEFFS: γ_{20} =0.1624, p <0.001; TCOOPS: γ_{30} = 0.0242, p = 0.005). The positive coefficients indicated that the higher the level of teachers' self-efficacy or teacher co-operation, the higher the prediction for teachers' constructivist beliefs, controlling other variables in the model. Hence, hypotheses 3a and 4a were supported. It is interesting to note that amount of experience was found to have a significant negative relationship with teachers' constructivist beliefs (γ_{10} = -0.0024, p =0.003). The coefficient was negative, indicating that the higher the amount of experience (YRSEXP), the lower the predicted score of teachers' constructivist beliefs. Hence, hypothesis 5a was supported. As for the level 2 variable, there was no statistically significant direct effect of the principal instructional leadership at the school level on the teachers' constructivist beliefs (γ_{01} = 0.0112, p = 0.5220). Hence, hypothesis 2 was not supported. Teachers' background, including class size (CLASSIZ) and percentage of time spent on actual teaching (TIMETEAC) did not directly affect the teachers' constructivist beliefs (γ_{40} = -0.0013, p = 0.206; γ_{50} = -0.0009, p = 0.1490).

Mexico

The HLM results for Mexico have been presented in Table 4.11. Model 4, as a full unconditional model, contain all level-1 and level-2 variables; the cross-level interactions and all slopes can be varied across schools. The estimate for the grand mean was γ_{00} = 3.296 (p <0.001).

H1: Constructivism will vary among the schools.

The outputs suggested that schools in Mexico differed significantly in terms of their average teachers' constructivist beliefs. The estimation of variance components for teachers' constructivist beliefs are σ^2 = 0.264 at the teacher level and τ_{00} = 0.005 (p < .001) at the school level. Thus, hypothesis 1 was supported.

The ICC was 0.0049/(0.0049+0.2640) = 0.018, indicating that schools accounted for about 2% of the variability in teachers' constructivist beliefs. Still, most of the variation was found at the individual level (e.g., teachers). As a result of an examination of the residual variance (level-1, r), the residual component dropped from 0.2640 (the null model) to 0.2419 (model 4). The proportion of variance explained at the teacher level compared to the null model was (0.2640-0.2419)/0.2640 = 0.084. Variables in model 4, including YRSEXP, TSELEFFS, TCOOPS, CLASSSIZ, and TIMETEAC, explained about 8% of the variance in teachers' constructivist beliefs.

H2: Principal instructional leadership will have a positive direct effect on teacher constructivist beliefs.

H3a: Teachers' self-efficacy will have a direct effect on teacher constructivist beliefs.

H4a: Teacher co-operation will have a direct positive effect on teacher constructivist beliefs.

H5a, H6a, and H7a: Teachers' background will have a direct effect on teacher constructivist beliefs.

Teachers' self-efficacy (TSELEFFS) and amount of experience (YRSEXP) were found to have significant positive relationship with teachers' constructivist beliefs (γ_{20} =0.173, $p < 0.001$; γ_{10} = 0.0037, p = 0.0010). Hence, hypotheses 3a and 5a were supported. The positive coefficients mean that the higher the level of teachers' self-efficacy or the years of experience, the higher the predicted teachers' constructivist beliefs, when other variables were held constant. Although there was no statistically significant direct effect of the principal instructional leadership (PINSLEAD) at the school level on the teachers' constructivist belief (γ_{01} = -0.0276, p = 0.179), there was a statistically significant relationship of the cross-level interaction (hypothesis 6a).

Hypotheses 2a and 4a were not supported. Other teachers' background variables, such as class size (CLASSIZ) and percentage of time spent on actual teaching (TIMETEAC) did not directly affect the teachers' constructivist beliefs (γ_{40} = -0.0004, p = 0.728; γ_{50} = 0.0014, p = 0.073). Hence, hypotheses 6a and 7a were not supported.

H3b: The effect of teachers' self-efficacy will vary among the schools.

H4b: The effect of teacher co-operation will vary among schools.

H5b, H6b, and H7b: The effect of teachers' background will vary among schools.

The random effect of school on slopes of teachers' self-efficacy (TSELEFFS slope, *u2),* teacher co-operation (TCOOPS slope, u3), and class size (CLASSSIZ slope, u_4) were statistically significant. The significant chi-square tests indicated that the hypothesis that there is no difference in slopes of TSELEFFS, TCOOPS, and CLASSSIZ among schools was rejected. Hence, hypotheses 3b, 4b, and 6a were supported.

H8a: The relationship between self-efficacy and teacher constructivist beliefs will be moderated by principals' instructional leadership.

H8b: The relationship between teacher co-operation and teacher constructivist beliefs will be moderated by principals' instructional leadership.

It was found that principal instructional leadership (PINSLEAD) significantly moderated the relationship between teachers' self-efficacy and teachers' constructivist beliefs (γ_{21} = -1.261, p = 0.004). With a negative coefficient, a one unit increase in principal instructional leadership was associated with a 1.261 decrease in the slope of the relationship between teachers' self-efficacy and teachers' constructivist belief. Hypothesis 8a was supported. By contrast, principal instructional leadership did not have a significant effect on the slope of the relationship between teacher co-operation and teachers' constructivist beliefs (γ_{31} = 0.0254, p = 0.177). Hence, hypothesis 8b was not supported.

Summary

This chapter presents the results of the study. The first section reports on the descriptive statistics of the key variables and also discusses the handling of missing data, the development of the latent constructs, and assumption testing for linear regression analysis. The second section discusses the CFA measurement model development and assessment. The model fit indices and construct reliability and validity are reported. Finally, the last section includes a comparison of the hierarchical linear models, the proposed hypothesis testing, and the findings.

CHAPTER 5

Discussion

This chapter is divided into three sections. The first section includes the summary of the major findings from the hypothesis testing. The second section discusses the implications for practitioners (e.g., school administrators, teachers, and curriculum developers). Finally, the third section indicates the directions for future research.

Summary of Major Findings

This study utilized a cross-national data set of the Teaching and Learning International Study (TALIS) 2013 to investigate the relationships among lower secondary school teachers' constructivist beliefs, self-efficacy beliefs, teacher co-operation, selected teacher background information (e.g., work experience, class size), and the school principals' instructional leadership. A series of hierarchical linear modeling (HLM) studies were performed to analyze the data of 2 high performers, South Korea and Finland, and one low performer, Mexico. The purpose of the analysis was to understand the variations among the schools (if there was any) and to test whether the school-level predictor, which is the principal's instructional leadership, had a direct or moderating effect on teachers' beliefs and practices. The emphasis was placed on the individual-level effects. It is important to note that no causal effects could be inferred from this analysis. All of the findings represent correlation effects. Table 5.1 summarizes the supported hypotheses in this study. It is important to note that the TSELEFFS and TCOOPS constructs were created using different single rating-scale items for each country.

Table 5.1

Summary of Supported Hypotheses

	H1 *TCONSB*	***H2*** *PINSLEAD*	***H3a*** *TSELEFFS*	***H3b*** *TSELEFFS*	***H4a*** *TCOOPS*	***H4b*** *TCOOPS*	***H5a*** *Teacher Background*	***H5b*** *Teacher Background*	***H6a*** *Cross-Level Interaction*	***H6b*** *Cross-Level Interaction*
South Korea			Y +		Y +	Y				
Finland	Y		Y +		Y +		Y[a] -			
Mexico	Y		Y +	Y		Y	Y[a] +	Y[b]	Y -	

Note: (+) indicates a positive coefficient; (-) indicates a negative coefficient.
[a] Number of years of experience as a teacher (YRSEXP)
[b] Number of students enrolled in a target class (CLASSSIZ)

Do the constructivist beliefs vary across schools?

The findings suggest that schools in South Korea did not vary significantly in terms of the teachers' constructivist beliefs, while schools in Finland and Mexico were found to vary significantly in terms of such belief. Nevertheless, the amount of variation in teachers' constructivist beliefs at the school level was rather small in all three countries, suggesting that most of the variation in the teachers' constructivist belief was within schools rather than between schools. This conclusion is consistent with the findings from the previous TALIS Report from OECD, which stated that significant variation in pedagogical beliefs was found at the teacher- and country-level (OECD, 2009). Specifically, the researchers reported that the teachers' beliefs were heterogeneous within schools. Teachers' beliefs within a school varied because their beliefs had been formed before they started to work at that school, and they stayed unchanged (OECD, 2009).

What factors have direct relationships with teachers' constructivist beliefs?

In both high and low performing countries with respect to cognitive skills and educational attainment, teachers' self-efficacy (TSELFFS) was found to have a significant positive relationship with the teachers' constructivist beliefs (TCONSB) ($p<.001$). To be specific, teachers' self-efficacy had the largest magnitude of coefficient among all predictors in this study. Although the direction of causality cannot be established by this cross-sectional data set, we learn that teachers who reported having high self-efficacy in South Korea, Finland, and Mexico tend to have high constructivist belief. It is essential to note that the teachers' self-efficacy construct was created using different single rating-scale items for each country. The items measuring teachers' self-efficacy that were identical among high and lower performers are 1) ability to craft good questions for my students, 2) ability to provide an alternative explanation, and 3) ability to help my students value learning. The items measuring teachers' self-efficacy that were identical only among the high performers include 1) ability to control disruptive behavior in the classroom, 2) ability to make my expectation about student behavior clear, and 3) ability to motivate students who show low interest in school work. The teachers' self-efficacy construct in the Finland model contains more measurement items related to classroom management, while the self-efficacy construct in the South Korea and Mexico models contains more measurements related to classroom instruction.

Next, teacher co-operation (TCOOPS) was found to have a significant positive relationship with the teachers' constructivist beliefs only in the high performers, South Korea and Finland ($p = 0.012$; $p = 0.005$, respectively). Hence, teachers who were more engaged in teacher co-operation, including professional collaboration and exchange and coordination for teaching, reported higher levels of constructivist beliefs. The results suggest that teachers collaborating by sharing experience that can promote learning would improve their classroom instruction (Goddard, Goddard, and Tschannen-Moran, 2007) and increase the possibilities of finding new ways of teaching (Haycock, 1998).

Years of working experience as a teacher (YRSEXP) was also found to have a significant relationship with teachers' constructivist beliefs in Finland and Mexico. However, these relationships were in the reverse direction. In Finland, the negative coefficient suggests that a unit increase in working experience (i.e., one year) is associated with a 0.002 decrease in teachers' constructivist beliefs. Since teachers' ages and their amounts of working experiences were highly correlated, this result also implies that the idea of constructivist instruction is more accepted among younger teachers in Finland. In contrast, constructivism in teaching tends to be well-accepted among teachers with more teaching experience or, one could say, the older teachers in Mexico. The results further revealed that there was no statistically significant relationship between amount of working experience and teachers' constructivist beliefs among teachers in South Korea. Hence, teachers' age and amount of working experience would not imply any level of belief in constructivism.

It is important to note that there was no statistically significant relationship between principal instructional leadership (PINSLEAD) and the variation in teachers' constructivist beliefs among teachers and schools. One of the possible explanations is that the variation in teachers' constructivist beliefs occurred mostly within schools. Any constructs at the school or principal level would account for a very small amount of variance in teachers' constructivist beliefs.

Additionally, the findings showed that the average class size was varied across countries and across levels of performance. There was an average of 33 students in a class in South Korea, 17 students in Finland, and 34 students in Mexico. However, there was no statistically significant relationship between the number of students enrolled in a target class (CLASSSIZ) and the teachers' constructivist beliefs in any country. Similarly, time spent on actual teaching (TIMETEAC) did not have a significant relationship with the teachers' constructivist beliefs in any country. Teachers were equally willing to adopt the ideas of constructivist approaches regardless of their class size when the class had between 17-34 students. Also, teachers were equally willing to adopt the ideas of constructivist approaches regardless of the amount of time they actually spent on teaching, which was found to be 75% - 81% of the class hour.

Does principal instructional leadership moderate the relationship between teacher-level predictors, namely self-efficacy and teacher co-operation, and constructivist beliefs?

Generally, the objective of principal instructional leadership is to improve classroom practice by positively influencing practices and beliefs among classroom teachers (Blase & Blase, 2000). Therefore, school principals with a high level of instructional leadership would be expected to positively influence the teachers' beliefs.

In this current study, the principal instructional leadership was not directly associated with the teachers' constructivist beliefs; instead, the principal leadership significantly moderated the relationship between teachers' self-efficacy and teachers' constructivist beliefs (in Mexico).

The negative coefficient indicates that the relationship between teachers' self-efficacy and teachers' constructivist beliefs became weaker, by $\gamma21 = 0.1261$ units, as principals' instructional leadership increased by one unit. This implies that the principals in Mexico were able to reduce the impact of teachers' self-efficacy on teachers' constructivist beliefs through their level of instructional leadership. The higher the level of instructional leadership, the lesser the impact of teachers' self-efficacy on teachers' constructivist beliefs. That is, the principals, aiming to enhance the constructivist beliefs, could demonstrate a high degree of instructional leadership in schools so that teachers would not rely as much on their individual teaching confidence but rather would adopt the constructivist approach. Nevertheless, this case would not applicable to the principals and teachers in South Korea and Finland, where the effects of self-efficacy on teachers' constructivist beliefs were not affected by the principals' influence.

Furthermore, the results showed a consistency among the principals and teachers in South Korea and Finland, where the principals' leadership did not affect the relationship between teachers' co-operation and their constructivist beliefs. Indeed, one can conclude that principals did not have any impact, either directly or indirectly, on the teachers' constructivist beliefs. The constructivist beliefs among teachers in South Korea and Finland relied mainly on the individual teachers' confidence in their teaching ability and their level of co-operation with colleagues.

Practical Implications

A number of studies have emphasized the importance of the concept of constructivism in learning and teaching (e.g., Singer & Moscovici 2008; Witteck, Beck, Most, Kienast, & Eilks, 2014). Recently, numerous researchers have advocated for the transition from a traditional approach to a more constructivist-oriented instruction approach with an aim to helping students enhance their critical thinking skills and problem solving skills (e.g., Barak & Shakhman, 2007; Ford, 2010; Nadelson et al., 2013). As a constructivist instructional approach has proven to increase students' learning outcome significantly, this approach has since become more dominant in schools and teacher education programs (Bybee et al., 2006; Fang & Ashley, 2004; Marlowe & Page, 2005).

The current study examined the antecedents of teachers' constructivist beliefs including teachers' self-efficacy, the level of teacher co-operation, teacher background and teaching information, and the principals' instructional leadership. Based on the results of the analysis, the implications are provided as follows.

Focusing on the teacher level

Schools in both high and low performing systems accounted for a very small amount of the variability in teachers' constructivist beliefs. The greatest part of the variation in lower secondary education teachers' constructivist beliefs was seen at the individual level. Therefore, school principals and administrators who intend to increase the level of constructivist beliefs would have to focus on the individual level. One of the implications may include empowering individual teachers in high performing systems (i.e., South Korea and Finland). As such, the teachers can enjoy the autonomy to design their own curriculum, lesson plan, or assessment – rather than using standardized tests or curriculum that were designed for the whole education system. As for the teachers in Mexico, focusing on the teacher level implication may include the personal interactions between the school principal and teachers to show support and encouragement that a teacher could perform a given task, since the instructional leadership of school principals in Mexico was indirectly associated with the level of teachers' constructivist belief.

Enhancing Perception of Self-Efficacy through Teacher Preparation and Professional Development Programs

The results of this study revealed a clear and important link between the level of teachers' constructivist beliefs and that of their self-efficacy beliefs in both high and low performing systems. Teachers who reported having a high level of self-efficacy tended to have a high level of constructivist beliefs, and vice versa. This is consistent with findings in the previous literature, which were that teachers with high self-efficacy tend to try innovative instructional practices that address student learning needs (Ghaith & Yaghi, 1997; Protheroe, 2008).

Based on this evidence, rather than focusing only on the development of content knowledge and general pedagogy, curriculum developers should design teacher preparation programs that allow pre-service teachers to experience and engage in inquiry-based learning environments so that the pre-service teachers can actually understand the learning process, feel prepared, and gain confidence in this teaching method. Similarly, teacher professional development for in-service teachers should allow these teachers to experience and engage in inquiry-based learning environments since training and development is one of the determinants of teachers' self-efficacy (Bandura, 1993; Protheroe, 2008).

Teachers' beliefs were found to be diverse and varied in schools. Thus, an opportunity to engage and have a hands-on experience in student-centered environments may challenge teachers' existing beliefs, as well as increase their awareness, along with that of the principal, of this instructional method. Most importantly, school administrators' support for and commitment to this instructional method are necessary to ensure the teachers' prolonged participation in the development programs. This school support should include time allocation for teachers to participate in professional learning and the initiation of comprehensive teacher preparation programs, focusing on subject-matter knowledge and teaching practices.

Promoting Professional Activities

Despite the fact that South Korea and Finland, representing countries with high performing educational systems, have very different approaches in their teaching practices and educational systems, the association between the level of teacher co-operation and the teachers' self-efficacy was found to be significant in both countries. This simply means that the teachers who reported frequently engaging in professional collaboration or exchange and coordination for teaching are likely to have a high level of constructivist beliefs, and vice versa. Considering this finding, teachers should engage more in professional activities relating to teacher co-operation. The teacher co-operation construct includes the following items that were identical among the two countries: 1) exchange instructional materials, 2) engage in discussions about student learning, and 3) participate in team conference. The items corroborated the items suggested by numerous researchers (Goddard, Goddard & Tschannen-Moran, 2007) with an aim to helping teachers comprehend their knowledge in teaching and ultimately improve their instruction.

In order to increase the level of the teachers' co-operation and indirectly improve the teachers' constructivist beliefs, school principals and administrators may take the following steps to promote a school environment that supports teacher co-operation: 1) adjusting the length and structure of the work day for teachers so that they can set aside time beyond their teaching hours for collaborating with their colleagues and engaging in team planning, 2) managing school resources, including budget, technology, and location, to provide teachers with an opportunity to work together and to facilitate their collaborative work, 3) communicating goals and values, which will set the tone for the school culture and environment, ensuring that collaboration is part of the teachers' regular practices, and 4) promoting teachers' development plans that emphasize and reward teachers' collaboration.

Key Roles of School Principals

Based on the results in the high performing systems (i.e., South Korea and Finland), where there were excellent teaching workforce and the principal instructional leadership was not directly or indirectly associated with the teachers' constructivist beliefs, the systems worked best when the teachers were empowered and had high level of autonomy. Teachers who embraced the idea of using constructivist instruction could work on the curriculum development and instructional practices without any interventions from school principals or administrators. Hence, the autonomy of the school principals in the high performing systems should be maintained at a very low degree.

On the contrary, the school principals in Mexico could demonstrate a high degree of instructional leadership so the teachers would adopt the constructivist approach and rely less on their individual teaching confidence. The critical step for the low performing system is to improve the quality of leadership, particularly on instructional leadership, among school principals.

Directions for Future Research

Future Studies on Teachers' Constructivist Beliefs

One of the limitations of this study is that the author selected a limited number of key variables based on theoretical considerations. Thus, it would be preferable for future study to introduce new covariates in order to explore the variation of teachers' constructivist beliefs within and between schools. Also, other variables pertaining to teachers' and countries' characteristics should be taken into account to allow more in-depth analysis. Since TALIS is a cross-sectional data set, claims of causality could not be established in this analysis. The qualitative studies will help in uncovering the causes and effects in these relationships.

Future Studies Related to Teachers' Self-Efficacy Beliefs

In the current study, the teachers' self-efficacy construct consisted of 12 items representing the three sub-scales of teachers' self-efficacy: four items from self-efficacy in classroom management, four items from self-efficacy in instruction, and four items from self-efficacy in student engagement. Although self-efficacy is a multi-dimensional construct, the author found that these three sub-scale constructs yielded unacceptable reliability and validity when tested separately. Specifically, the average variance extract of a given sub-scale construct was lower than the squared inter-construct correlation estimates of the other self-efficacy sub-scale constructs, indicating an unsatisfactory validity. This is similar to other psychological constructs where a construct with a small number of measuring items, aiming to reflect a psychological concept at a global level, would yield a low reliability, as well as low convergent and discriminant validity. An important recommendation is to include additional measures in each sub-scale inventory to improve the measuring properties of each construct.

Based on the analysis of the teachers in Mexico, it can be concluded that principal instructional leadership significantly moderated the relationship between teachers' self-efficacy and constructivist beliefs. This likely occurred through principals' support of teacher co-operation, informing teachers on student outcome expectations as well as improving teachers' instructional skills. The negative influence on this relationship could be fully explained by an in-depth interview or other types of qualitative studies, which should lead to an answer to the "how" and the "why" of this phenomenon.

Future Studies Related to School Leadership

In trying to explain the effect of the principal on the teachers' beliefs, this study utilized the 3 measuring items from the TALIS data set to create a latent construct of principal instructional leadership. Although this construct provided good evidence for construct validity and reliability, the construct could not capture all dimensions of the principal instructional leadership as proposed by numerous researchers (e.g., Robinson et al., 2008; Hallinger, 2005; Hallinger & Murphy, 1987), let alone any specific understanding of the concept with regard to a particular culture or country.

Based on the instructional leadership framework (Hallinger, 1987; Hallinger & Murphy, 1985), there are three major constructs of instructional leadership: 1) defining the school mission, 2) managing the instructional program, and 3) promoting the learning climate. Further, each construct contains a variety of behaviors and practices. However, the latent construct created in this study contained only three single rating-scale items: 1) I took actions to support co-operation among teachers to develop new teaching practices, 2) I took actions to ensure that teachers took responsibility for improving their teaching skills, and 3) I took actions to ensure that teachers felt responsible for their students' learning outcomes. For the future study, one suggestion would be to include additional measures in the pool of the instructional leadership inventory. This will definitely enhance our ability to assess construct validity and to broaden our understanding of the concept of instructional leadership.

In terms of other principal management styles, TALIS 2013 provided a set of four items to measure "*principal distributed leadership*." Although the author found a non-significant association between the degree of principal distributed leadership and the level of teachers' constructivist beliefs among teachers and principals in South Korea, Finland, and Mexico, It would be interesting to include other constructs associated with different types of management styles, namely transformational (e.g., Bass, 1999; Smith, Montagno, & Kuzmenko, 2004), transactional (e.g., Avolio, Bass, & Jung, 1999; Judge & Piccolo, 2004), situational (e.g., Bass & Stogdill, 1990; Hersey, Blanchard, & Johnson, 1988), servant (Smith, Montagno, & Kuzmenko, 2004), and charismatic leadership styles (e.g., Conger & Kanungo, 1987). These frameworks have been extensively studied in the field of human resource development and would help in uncovering the meaningful relationships between principal practices and teachers' beliefs.

Summary

This chapter provides a discussion of the findings from the HLM analysis of the Teaching and Learning International Study (TALIS) 2013. The summary of the major findings, pertaining to the variation in the teachers' constructivist belief across schools and the relationship between constructivist beliefs and self-efficacy belief, degree of teacher co-operation, and teacher background, is presented. Additionally, this chapter discusses practical implications for school principals and administrators, curriculum developers, and teachers. Finally, recommendations for future research are provided.

REFERENCES

Abrams, E., Southerland, S. A., & Silva, P. (2007). *Inquiry in the classroom: Challenges and possibilities*. Greenwich, CT: Information Age Publishing.

Appleton, K. (2008). Developing science pedagogical content knowledge through mentoring elementary teachers. *Journal of Science Teacher Education*, *19*(6), 523-545.

Appleton, K., & Kindt, I. (2002). Beginning elementary teachers' development as teachers of science. *Journal of Science Teacher Education*, *13*(1), 43-61.

Allinder, R. M. (1994). The relationship between efficacy and the instructional practices of special education teachers and consultants. *Teacher Education and Special Education: The Journal of the Teacher Education Division of the Council for Exceptional Children*, *17*(2), 86-95.

Alsup, J. (2004). A Comparison of Constructivist and Traditional Instruction in Mathematics. *Educational Research Quarterly*, *28*(4), 3-17.

Ashton, P. T., & Webb, R. B. (1986). *Making a difference: Teachers' sense of efficacy and student achievement*. Longman Publishing Group.

Avolio, B. J., Bass, B. M., & Jung, D. I. (1999). Re-examining the components of transformational and transactional leadership using the Multifactor Leadership. *Journal of occupational and organizational psychology*, *72*(4), 441-462.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, *84*(2), 191.

Bandura, A. (1993). Perceived self-efficacy in cognitive development and function. *Educational psychologist*, *28*(2), 117-148.

Bandura, A. (1997). *Self-efficacy: the exercise of control*. New York: Freeman.

Bandura, A. (2006). Adolescent development from an agentic perspective. In F. Pajares, & T. Urdan (Eds.), *Self-efficacy beliefs of adolescents*. Greenwich, Connecticut: Information Age Publishing.

Barak, M., & Shakhman, L. (2007). Reform-based science teaching: Teachers’ instructional practices and conceptions. *Eurasian Journal of Mathematics, Science, and Technology Education*, *4*(1), 11-20.

Bass, B. M. (1999). Two decades of research and development in transformational leadership. *European journal of work and organizational psychology*, *8*(1), 9-32.

Bass, B. M., & Stogdill, R. M. (1990). Handbook of leadership. *Theory, Research & Managerial Applications, 3*.

Beamer, T., Van Sickle, M., Harrison, G., & Temple, G. (2008). Lasting impact of a professional development program on constructivist science teaching. *Journal of Elementary Science Education*, *20*(4), 49-60.

Blase, J., & Blase, J. (2000). Effective instructional leadership: Teachers' perspectives on how principals promote teaching and learning in schools. *Journal of Educational Administration*, *38*(2), 130-141.

Bliese, P. D. (1998). Group size, ICC values, and group-level correlations: A simulation. *Organizational Research Methods*, *1*(4), 355-373.

Brick, J. M., & Kalton, G. (1996). Handling missing data in survey research. *Statistical methods in medical research*, *5*(3), 215-238.

Buhi, E. R., Goodson, P., & Neilands, T. B. (2008). Out of sight, not out of mind: strategies for handling missing data. *American journal of health behavior*,*32*(1), 83-92.

Brooks, M. G., & Brooks, J. G. (1999). The courage to be a constructivist. *Educational Leadership, 57*(3), 18–24.

Bümen, N. T. (2009). Possible effects of professional development on Turkish teachers' self-efficacy and classroom practice. *Professional Development in Education*, *35*(2), 261-278.

Bybee, R. W., Taylor, J. A., Gardner, A., Van Scotter, P., Powell, J. C., Westbrook, A., & Landes, N. (2006). The BSCS 5E instructional model: Origins and effectiveness. Retrieved from the Office of Science Education of the National Institute of Health website:http://science.education.nih.gov/houseofreps.nsf/b82d55fa138783c2852572c9004 f5566/$FILE/Appendix%20D.pdf

Campbell, D.T. & Fiske, D.W. (1949). Convergent and discriminant validation by the multi-trait multi-method matrix. *Psychol. Bull*. 56(2), 81–105.

Cakir, M. (2008). Constructivist Approaches to Learning in Science and Their Implications for Science Pedagogy: A Literature Review. *International journal of environmental and science education*, *3*(4), 193-206.

Catano, N., & Stronge, J. H. (2007). What do we expect of school principals? Congruence between principal evaluation and performance standards.*International Journal of Leadership in Education*, *10*(4), 379-399.

Collins, L. M., Schafer, J. L., & Kam, C. M. (2001). A comparison of inclusive and restrictive strategies in modern missing data procedures. *Psychological methods, 6*(4), 330.

da Costa, J. L., & Riordan, G. (1996, April). Teacher efficacy and the capacity to trust. Paper presented at the annual meeting of the American Educational Research Association, New York.

Conger, J. A., & Kanungo, R. N. (1987). Toward a behavioral theory of charismatic leadership in organizational settings. *Academy of management review*, *12*(4), 637-647.

Danielson, C., & McGreal, T. L. (2000). *Teacher evaluation to enhance professional practice*. Ascd.

Darling-Hammond, L. (2006). Constructing 21st-century teacher education. *Journal of Teacher Education*, *57*(3), 300-314.

Darling-Hammond, L. (2010). *The flat world and education: How America's commitment to equity will determine our future*. New York: Teachers College Press.

Darling-Hammond, L., & McLaughlin, M. W. (1995). Policies that support professional development in an era of reform. *Phi delta kappan*, *76*(8), 597-604.

Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N., & Orphanos, S. (2009). *Professional learning in the learning profession*. Washington, DC: National Staff Development Council.

Davis, B., & Sumara, D. (2002). Constructivist discourses and the field of education: Problems and possibilities. *Educational theory*, *52*(4), 409-428.

de Vries, S., van de Grift, W. J., & Jansen, E. P. (2014). How teachers' beliefs about learning and teaching relate to their continuing professional development. *Teachers and Teaching*, *20*(3), 338-357.

Dede, C. (2010). Comparing frameworks for 21st century skills. *21st century skills: Rethinking how students learn*, *20*, 51-76.

Dewey, J. (1938). 1963. *Experience and education*. New York: Macmillan.

Dewey, J. (1897). My Pedagogic Creed. *School Journal (54)*. Available online at: http://www.pragmatism.org/genealogy/dewey/My_pedagogic_creed.htm

DiStefano, C., & Hess, B. (2005). Using confirmatory factor analysis for construct validation: An empirical review. *Journal of Psychoeducational Assessment*, *23*(3), 225-241.

Donmoyer, R. & Wagstaff, J. G. (1990). Principals can be effective managers and instructional leaders. *NASSP Bulletin*, *74*, 20-29.

Eltinge, E., & Roberts, C. (1993). Linguistic content analysis: A method to measure science inquiry in textbooks. *Journal of Research Science Teaching*, *30*, 65–83.

Erb, T. O. (1995). Teamwork in middle school education. In H. G. Garner (Ed.), *Teamwork models and experience in education*. Boston: Allyn & Bacon.

Etchegaray, J. M., & Fischer, W. G. (2010). Understanding evidence-based research methods: Reliability and validity considerations in survey research. *HERD: Health Environments Research & Design Journal, 4*(1), 131.

Fang, Z., & Ashley, C. (2004). Pre-service teachers' interpretations of a field-based reading block. *Journal of Teacher Education*, *55*(1), 39-54.

Feiman-Nemser, S. (2001). Helping novices learn to teach lessons from an exemplary support teacher. *Journal of teacher education*, *52*(1), 17-30.

Frase, L. (2001, April). *Impact of school principal classroom presence in large inner city schools*. Paper presented at the annual meeting of the American Educational Research Association, Seattle, WA.

Flath, B. (1989). The principal as instructional leader. *ATA magazines*, *69*(3), 19-22.

Ford, M. J. (2010). Critique in academic disciplines and active learning of academic content. *Cambridge Journal of Education*, *40*(3), 265-280.

Fornell, C. & Larcker, D. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error, *Journal of Marketing Research (18)*1, 39-50.

Fosnot, C. T. (2013). *Constructivism: Theory, perspectives, and practice*. Teachers College Press.

Fulton, K. P. (2003). Redesigning schools to meet 21st century learning needs. *THE Journal (Technological Horizons In Education)*, *30*(9), 30.

Garbett, D. (2011). Constructivism deconstructed in science teacher education. *Australian Journal of Teacher Education*, *36*(6), 3.

Garson, G. D. (Ed.). (2012). *Hierarchical linear modeling: Guide and applications*. Sage.

Gefen, D., & Straub, D. (2005). A practical guide to factorial validity using PLS-Graph: Tutorial and annotated example. *Communications of the Association for Information systems*, *16*(1), 5.

Geijsel, F. P., Sleegers, P. J., Stoel, R. D., & Krüger, M. L. (2009). The effect of teacher psychological and school organizational and leadership factors on teachers' professional learning in Dutch schools. *The elementary school journal*, *109*(4), 406-427.

Ghaith, G., & Yaghi, H. (1997). Relationships among experience, teacher efficacy, and attitudes toward the implementation of instructional innovation. *Teaching and Teacher Education*, *13*(4), 451-458.

Giallo, R., & Little, E. (2003). Classroom behaviour problems: The relationship between preparedness, classroom experiences, and self-efficacy in graduate and student teachers. *Australian Journal of Educational & Developmental Psychology*, *3*(1), 21-34.

Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology*, *76*(4), 569.

Gist, M. E., & Mitchell, T. R. (1992). Self-efficacy: A theoretical analysis of its determinants and malleability. *Academy of Management review*, *17*(2), 183-211.

Goddard, Y., Goddard, R., & Tschannen-Moran, M. (2007). A theoretical and empirical investigation of teacher collaboration for school improvement and student achievement in public elementary schools. *The Teachers College Record*, *109*(4), 877-896.

Goddard, Y. L., & Heron, T. E. (2001). The consultation process. In T. E. Heron & K. C. Harris, *The educational consultant: Helping professionals, parents, and mainstreamed students* (4th ed.). Austin, TX: PRO-ED.

Goddard, Y. L., Neumerski, C. M., Goddard, R. D., Salloum, S. J., & Berebitsky, D. (2010). A multilevel exploratory study of the relationship between teachers' perceptions of principals' instructional support and group norms for instruction in elementary schools. *The Elementary School Journal*, *111*(2), 336-357.

Gordon, M., & O'Brien, T.V. (2007). *Bridging theory and practice in teacher education. Rotterdam*: Sense Publishers.

Griffin, P., McGaw, B., & Care, E. (2012). *Assessment and teaching of 21st century skills*. Dordrecht: Springer.

Gumus, S., Bulut, O., & Bellibas, M. S. (2013). The relationship between principal leadership and teacher collaboration in Turkish primary schools: A multilevel analysis. *Education, Research and Perspectives*, *40*, 1.

Guskey, T. R. (1988). Teacher efficacy, self-concept, and attitudes toward the implementation of instructional innovation. *Teaching and Teacher Education*, *4*, 63-69.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Englewood Cliffs: Prentice Hall.

Hallinger, P., & Murphy, J. F. (1987). Assessing and developing principal instructional leadership. *Educational leadership*, *45*(1), 54-61.

Hallinger, P., & Murphy, J. (1985). Assessing the instructional management behavior of principals. *The Elementary School Journal*, 217-247.

Hallinger, P. (2005). Instructional leadership and the school principal: A passing fancy that refuses to fade away. *Leadership and Policy in Schools, 4*(3), 221-239.

Halverson, R., Grigg, J., Prichett, R., & Thomas, C. (2007). The new instructional leadership: Creating data-driven instructional systems in schools. *Journal of School Leadership, 17*, 159–193.

Ham, S. H., Ahn, S. H. G., Cha, Y. K., Ju, M. K., Kim, S., Ku, H., Lee, S.K., & Park, Y. S. (2013). Principal instructional leadership and teaching for learner autonomy: A multilevel analysis of the case of South Korea. *Stanisław Juszczyk*, 247.

Hammerness, K. (2013). Examining features of teacher education in Norway. *Scandinavian Journal of Educational Research*, *57*(4), 400-419.

Haney, J. J., Lumpe, A. T., & Czerniak, C. M. (2003). Constructivist beliefs about the science classroom learning environment: Perspectives from teachers, administrators, parents, community members, and students. *School Science and Mathematics*, *103*(8), 366-377.

Hartle, R. T., Baviskar, S., & Smith, R. (2012). A Field Guide to Constructivism in the College Science Classroom: Four Essential Criteria and a Guide to Their Usage. *Bioscene: Journal of College Biology Teaching*, *38*(2), 31-35.

Hattie, J. (2009). Visible learning. *A synthesis of over 800 meta-analyses relating to achievement*. Oxford: Routledge.

Haycock, K. (1998). What Works: Collaborative Cultures, Team Planning and Flexible Scheduling. *Teacher Librarian*, *25*(5), 28.

Hayes, A. F. (2006). A primer on multilevel modeling. *Human Communication Research*, *32*(4), 385-410.

Heck, R. H., & Moriyama, K. (2010). Examining relationships among elementary schools' contexts, leadership, instructional practices, and added-year outcomes: a regression discontinuity approach. *School Effectiveness and School Improvement*, *21*(4), 377-408.

Hendriks, M., & Steen, R. (2012). Results from School Leadership Effectiveness Studies (2005–2010). *School Leadership Effects Revisited*. Springer Netherlands.

Herschbach, D. R. (2011). The STEM initiative: Constraints and challenges. *Journal of Stem Teacher Education*, *48*(1), 96-122.

Hersey, P., Blanchard, K. H., & Johnson, D. E. (1988). *Management of organizational behavior*.

Hox, J. (2010). *Multilevel analysis: Techniques and applications*. Routledge.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: a multidisciplinary journal*, *6*(1), 1-55.

Huber, S. G., & Muijs, D. (2010). School leadership effectiveness: The growing insight in the importance of school leadership for the quality and development of schools and their pupils. In *School leadership-international perspectives*. Springer Netherlands.

Isikoglu, N., Basturk, R., & Karaca, F. (2009). Assessing in-service teachers' instructional beliefs about student-centered education: A Turkish perspective. *Teaching and Teacher Education*, *25*(2), 350-356.

Jensen, B., Sandoval-Hernández, A., Knoll, S., & Gonzalez, E. J. (2012). *The Experience of New Teachers Results from TALIS 2008*. OECD. Retrieved from http://www.oecd-ilibrary.org/content/book/9789264120952-en

Jones, M. G., & Brader-Araje, L. (2002). The impact of constructivism on education: Language, discourse, and meaning. *American Communication Journal, 5*(3), 1-10.

Jöreskog, K. G., & Sörbom, D. (1993). *LISREL 8: Structural equation modeling with the SIMPLIS command language*. Scientific Software International.

Judge, T. A., & Piccolo, R. F. (2004). Transformational and transactional leadership: a meta-analytic test of their relative validity. *Journal of applied psychology, 89*(5), 755.

Kelly, J. (2000). Rethinking the elementary science methods course: A case for content, pedagogy, and informal science education. *International Journal of Science Education*, *22*(7), 755-777.

Khalid, A., & Azeem, M. (2012). Constructivist vs traditional: effective instructional approach in teacher education. *International Journal of Humanities and Social Science*, *2*(5), 170-177.

Kwok, O. M., Underhill, A. T., Berry, J. W., Luo, W., Elliott, T. R., & Yoon, M. (2008). Analyzing longitudinal data with multilevel models: An example with individuals living with lower extremity intra-articular fractures. *Rehabilitation Psychology*, *53*(3), 370.

Larsen, R. (2011). Missing data imputation versus full information maximum likelihood with second-level dependencies. *Structural Equation Modeling: A Multidisciplinary Journal, 18*(4), 649-662.

Lord, T.R. (1999). A comparison between traditional and constructivist teaching in environmental science. *Journal of Environmental Education, 30*(3), 22-28.

Klassen, R. M., Bong, M., Usher, E. L., Chong, W. H., Huan, V. S., Wong, I. Y. F, & Georgiou,

T. (2009). Exploring the validity of a Teachers' Self-Efficacy Scale in five countries. *Contemporary Educational Psychology, 34*(1), 67-76.

Klassen, R. M., Tze, V. M., Betts, S. M., & Gordon, K. A. (2011). Teacher efficacy research 1998–2009: signs of progress or unfulfilled promise?. *Educational Psychology Review*, *23*(1), 21-43.

Kline, R.B. (2005), *Principles and Practice of Structural Equation Modeling* (2nd ed.). New York: The Guilford Press.

Kyriakides, L. (2006). Using international comparative studies to develop the theoretical framework of educational effectiveness research: A secondary analysis of TIMSS 1999 data. *Educational Research and Evaluation*, *12*(6), 513-534.

Leithwood, K., Harris, A. & Hopkins, D. (2008). Seven strong claims about leadership and the performance of international innovation seeking alliances. *The Leadership Quarterly, 20*, 191–206.

Leithwood, K., & Jantzi, D. (2006). Transformational school leadership for large-scale reform: Effects on students, teachers, and their classroom practices. *School effectiveness and school improvement*, *17*(2), 201-227.

Leithwood, K., Louis, K. S., Anderson, S., & Wahlstrom, K. (2004). *How leadership influences student learning: A review of research for the Learning from Leadership Project*. New York: The Wallace Foundation.

Liaw, S. (2004). Considerations for developing constructivist web-based learning. *International Journal of Instructional Media, 31*(3), 309-321.

Levačić, R. (2005). Educational Leadership as a Causal Factor Methodological Issues in Research on Leadership 'Effects'. *Educational Management Administration & Leadership*, *33*(2), 197-210.

Lord, T. R. (1999). A comparison between traditional and constructivist teaching in environmental science. *The Journal of Environmental Education, 30*(3), 22-27.

May, H., & Supovitz, J. A. (2011). The scope of principal efforts to improve instruction. *Educational Administration Quarterly, 47*, 332-352.

Mackinnon, G. R. (2004). Computer-mediated communication and science teacher training: Two constructivist examples. *Journal of Technology and Teacher Education, 12*(1), 101-114.

Marlowe, B. A., & Page, M. L. (2005). *Creating and sustaining the constructivist classroom*. Corwin Press.

McHenry, A. N. (2009). *The Relationship between Leadership Behaviors, Teacher*

Collaboration, and Student Achievement. ProQuest LLC.

Merrill, M. D. (1991). Constructivism and Instructional Design. *Educational technology*, *31*(5), 45-53.

Montiel-Overall, P. (2005). Toward a Theory of Collaboration for Teachers and Librarians. *School library media research*, *8*.

Muijs, D., & Reynolds, D. (2002). Teachers' beliefs and behaviors: What really matters?. *The Journal of Classroom Interaction*, 3-15.

Nadelson, L. S., Callahan, J., Pyke, P., Hay, A., Dance, M., & Pfiester, J. (2013). Teacher STEM perception and preparation: Inquiry-based STEM professional development for elementary teachers. *The Journal of Educational Research*, *106*(2), 157-168.

Nezlek, J. B. (2008). An introduction to multilevel modeling for social and personality psychology. *Social and Personality Psychology Compass*, *2*(2), 842-860.

Nie, Y., Tan, G. H., Liau, A. K., Lau, S., & Chua, B. L. (2013). The roles of teacher efficacy in instructional innovation: Its predictive relations to constructivist and didactic instruction. *Educational Research for Policy and Practice*, *12*(1), 67-77.

O'Connell, A. A., & McCoach, D. B. (Eds.). (2008). *Multilevel modeling of educational data*. IAP.

OECD. (2014). TALIS 2013 Results: An International Perspective on Teaching and Learning, OECD Publishing. Retrieved from http://dx.doi.org/10.1787/9789264196261-en

OECD. (2013). The TALIS Conceptual Framework. OECD Publishing. Retrieved from http://www.oecd.org/edu/school/TALIS%20Conceptual%20Framework_FINAL.pdf

OECD. (2009). Creating effective teaching and learning environments: First results from TALIS. OECD Publishing. Retrieved from http://www.oecd-ilibrary.org/education/creating-effective-teaching-and-learning-environments_9789264068780-en

Pajak, E., & McAfee, L. (1992). The principal as school leader, curriculum leader. *NASSP Bulletin*, *76*(547), 21-30.

Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *Review of Educational Research*, *62*(3), 307-332.

Parise, L. M., & Spillane, J. P. (2010). Teacher learning and instructional change: How formal and on-the-job learning opportunities predict change in elementary school teachers' practice. *The Elementary School Journal*, *110*(3), 323-346.

Pearson (2014). The Learning Curve 2014 Education and Skills for Life. Pearson. Retrieved

From http://thelearningcurve.pearson.com/content/download/bankname/components/filename/The_Learning_Curve_2014-Final_1.pdf

Peterson, R. A., & Kim, Y. (2013). On the relationship between coefficient alpha and composite reliability. *Journal of Applied Psychology*, *98*(1), 194.

Peugh, J. L., & Enders, C. K. (2004). Missing data in educational research: A review of reporting practices and suggestions for improvement. *Review of Educational Research*, *74*(4), 525-556.

Prawat, R. S. (1996). Constructivism, modern and postmodern. *Educational Psychologist, 31*, 215–226.

Protheroe, N. (2008). Teacher Efficacy: What Is It and Does It Matter? *Principal*, *87*(5), 42-45.

Pugach, M. C., & Johnson, L. J. (1995). Unlocking expertise among classroom teachers through structured dialogue: Extending research on peer collaboration. *Exceptional Children, 62*, 101-110.

Raudenbush, S.W. & Bryk, A.S. (2002). *Hierarchical linear models: Applications and data analysis methods*. Sage Publications..

Rice, R. C., & Islas, M. R. (2001). TIMSS and the Influence of the Instructional Leader on Mathematics and Science Performance. *NASSP Bulletin*, *85*(623), 5-9.

Richardson, V. (2003). Constructivist pedagogy. *The Teachers College Record*, *105*(9), 1623-1640.

Rigelman, N. M., & Ruben, B. (2012). Creating foundations for collaboration in schools: Utilizing professional learning communities to support teacher candidate learning and visions of teaching. *Teaching and Teacher Education*, *28*(7), 979-989.

Robinson, V. M., Lloyd, C. A., & Rowe, K. J. (2008). The impact of leadership on student outcomes: An analysis of the differential effects of leadership types. *Educational Administration Quarterly*, *44*(5), 635-674.

Ross, J., & Bruce, C. (2007). Professional development effects on teacher efficacy: Results of randomized field trial. *The Journal of Educational Research*, *101*(1), 50-60.

Savasci, F., & Berlin, D. F. (2012). Science teacher beliefs and classroom practice related to constructivism in different school settings. *Journal of Science Teacher Education*, *23*(1), 65-86.

Schuman, L. (1996). *Perspectives on Instruction*. Retrieved from http://edweb.sdsu.edu/courses/edtec540/Perspectives/Perspectives.html

Seashore Louis, K., Dretzke, B., & Wahlstrom, K. (2010). How does leadership affect student achievement? Results from a national US survey. *School effectiveness and school improvement*, *21*(3), 315-336.

Seidel, T., & Shavelson, R. J. (2007). Teaching effectiveness research in the past decade: The role of theory and research design in disentangling meta-analysis results. *Review of Educational Research, 77*, 454-499.

Sercu, L., del Carmen Méndez García, M., & Prieto, P. C. (2005). Culture learning from a constructivist perspective. An investigation of Spanish foreign language teachers' views. *Language and Education*, *19*(6), 483-495.

Schrage, M. (1991). *Shared minds: The new technologies of collaboration*. Random House Inc..

Shallcross, T., Spink, E., Stephenson, P., & Warwick, P. (2002). How primary trainee teachers perceive the development of their own scientific knowledge: links between confidence, content and competence?. *International Journal of Science Education*, *24*(12), 1293-1312.

Singer, F. M., & Moscovici, H. (2008). Teaching and learning cycles in a constructivist approach to instruction. *Teaching and Teacher Education*, *24*(6), 1613-1634.

Skaalvik, E. M., & Skaalvik, S. (2010). Teacher self-efficacy and teacher burnout: A study of relations. *Teaching and Teacher Education*, *26*(4), 1059-1069.

Smith, B. N., Montagno, R. V., & Kuzmenko, T. N. (2004). Transformational and servant leadership: Content and contextual comparisons. *Journal of Leadership & Organizational Studies, 10*(4), 80-91.

Smylie, M. A. (1988). The enhancement function of staff development: Organizational and psychological antecedents to individual teacher change. *American Educational Research Journal, 25* (1), 1-30.

Snijders, T., & Bosker, R. (1999). *Multilevel analysis: An introduction to basic and applied multilevel analysis*. Sage Publications.

Stipek, D. J., Givvin, K. B., Salmon, J. M., & MacGyvers, V. L. (2001). Teachers' beliefs and practices related to mathematics instruction. *Teaching and teacher education*, *17*(2), 213-226.

Strauss, M. E., & Smith, G. T. (2009). Construct validity: Advances in theory and methodology. *Annual review of clinical psychology*, *5*, 1.

Stodolsky, S. S., & Grossman, P. L. (1995). The impact of subject matter on curricular activity:

An analysis of five academic subjects. *American Educational Research Journal, 32*(2), 227-249.

Stofflett, Rene T. (1998). Putting Constructivist Teaching into Practice in Undergraduate Introductory Science. *Electronic Journal of Science Education, 3*(2).

Streiner, D. L. (2003). Starting at the beginning: an introduction to coefficient alpha and internal Consistency. *Journal of Personality Assessment, 80*, 99-103.

Szilagyi, J., & Szecsi, T. (2011). Transforming teacher education in Hungary: Competencies for elementary teachers. *Childhood Education, 87*(5), 327-331.

Taber, K. S. (2014). Constructing Active Learning in Chemistry: Concepts, Cognition and Conceptions. *Learning with Understanding in the Chemistry Classroom*. Springer Netherlands.

Teddlie, C. (2005). Methodological Issues Related to Causal Studies of Leadership A Mixed Methods Perspective from the USA. *Educational Management Administration & Leadership, 33*(2), 211-227.

Thayer-Bacon, B. J. (2000). *Transforming critical thinking: Thinking constructively*. Teachers College Press.

Thoonen, E. E., Sleegers, P. J., Oort, F. J., Peetsma, T. T., & Geijsel, F. P. (2011). How to improve teaching practices the role of teacher motivation, organizational factors, and leadership practices. *Educational Administration Quarterly, 47*(3), 496-536.

Tschannen-Moran, M., Hoy, A. W., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of educational research, 68*(2), 202-248.

Valverde, G.A., & Schmidt, W.H. (2000). Greater expectations: learning from other nations in the quest for 'world-class standards' in US school mathematics and science. *Journal of Curriculum Studies, 32*(5), 651-687.

van der Schaaf, M. F., Stokking, K. M., & Verloop, N. (2008). Teacher beliefs and teacher behaviour in portfolio assessment. *Teaching and Teacher Education, 24*(7), 1691-1704.

van de Vijver, F., & Leung, K. (1997). *Methods and data analysis of comparative research*. Allyn & Bacon.

Vieluf, S., Kunter, M., & van de Vijver, F. J. (2013). Teacher self-efficacy in cross-national perspective. *Teaching and Teacher Education, 35*, 92-103.

Vlaardingerbroek, B., & Taylor, T. N. (2003). Teacher education variables as correlates of primary science ratings in thirteen TIMSS systems. *International Journal of Educational Development, 23*(4), 429-438.

Vygotsky, L. S. (1962). *Thought and language*. Cambridge, M.A.: MIT Press.

Vygotsky, L. S. (1978). Tool and symbol in child development. In M. Cole, V. John-Steiner, S. Scribner, & E. Souberman (Eds.). *Mind in Society: The development of higher psychological processes*. Cambridge, Mass: Harvard University Press.

Wahlstrom, K. L., & Louis, K. S. (2008). How teachers experience principal leadership: The roles of professional community, trust, efficacy, and shared responsibility. *Educational Administration Quarterly, 44*(4), 458-495.

Wang, C. K. J., Liu, W. C., Lim, B. S. C., & Li, F. (2013). Longitudinal changes in physical fitness performance in youth: A multilevel latent growth curve modeling approach. *European Physical Education Review*. *19*(3), 329-346.

Watters J. J., & Ginns, I. S. (2000). Developing motivation to teach elementary science: Effect of collaborative and authentic learning practices in pre-service education. *Journal of Science Teacher Education*, *11*(4), 277-313.

Ware, H., & Kitsantas, A. (2007). Teacher and collective efficacy beliefs as predictors of professional commitment. *The Journal of Educational Research*, *100*(5), 303-310.

Webb, R. B., & Ashton, P. T. (1986). Teacher motivation and the conditions of teaching: A call for ecological reform. *Journal of Thought*, 43-60.

Wei, R. C., Darling-Hammond, L., Andree, A., Richardson, N., & Orphanos, S. (2009). Professional learning in the learning profession. *A Status Report on Teacher Development in the US and Abroad (Technical Report)*.

West, S. G., Finch, J. F., & Curran, P. J. (1995). *Structural equation models with nonnormal variables: Problems and remedies*.

West, B.T., Welch, K.B., & Galecki, A.T. (2007). *Linear mixed models: A practical guide using statistical software*. Boca Raton, FL: Chapman & Hall/CRC.

Wilkins, J. L. (2008). The relationship among elementary teachers' content knowledge, attitudes, beliefs, and practices. *Journal of Mathematics Teacher Education*, *11*(2), 139-164.

Windschitl, M. (1999a). A Vision Educators Can Put into Practice: Portraying the Constructivist Classroom as a Cultural System. *School Science and Mathematics, 99*(4), 189-196.

Windschitl, M. (1999b). Challenges of Sustaining a Constructivist Classroom Culture, The. *Phi Delta Kappan, 80*(10), 751.

Witteck, T., Beck, K., Most, B., Kienast, S., & Eilks, I. (2014). The Learning Company Approach to Promote Active Chemistry Learning: Examples and Experiences from

Lower Secondary Education in Germany. In *Learning with Understanding in the Chemistry Classroom*. Springer Netherlands.

Woolfolk, A. (2010). *Educational psychology*. Upper Saddle River, New Jersey: Merrill.

Woolfolk Hoy, A., Davis, H., & Pape, S. J. (2006). Teacher knowledge and beliefs. *Handbook of educational psychology*, *2*, 715-738.

Yore, L. D., Anderson, J. O., & Shymansky, J. A. (2005). Sensing the impact of elementary school science reform: A study of stakeholder perceptions of implementation, constructivist strategies, and school–home collaboration. *Journal of Science Teacher Education*, *16*(1), 65-88.