

**Analysis of Factors Influencing Teachers' Instructional Practices and Innovation in  
Kazakhstan: Evidence from TALIS 2018**

Axlu Kulmagambetova

Submitted in partial fulfilment of the requirements for the degree of

Master of Science

in Educational Leadership

Nazarbayev University Graduate School of Education

May 2022

Word Count: 13, 572

## **AUTHOR AGREEMENT**

By signing and submitting this license, I grant to Nazarbayev University (NU) the non-exclusive right to reproduce, convert (as defined below), and/or distribute my submission (including the abstract) worldwide in print and electronic format and in any medium, including but not limited to audio or video.

I agree that NU may, without changing the content, convert the submission to any medium or format for the purpose of preservation.

I also agree that NU may keep more than one copy of this submission for purposes of security, back-up and preservation.

I confirm that the submission is my original work and that I have the right to grant the rights contained in this license. I also confirm that my submission does not, to the best of my knowledge, infringe upon anyone's copyright. If the submission contains material for which I do not hold copyright,

I confirm that I have obtained the unrestricted permission of the copyright owner to grant NU the rights required by this license and that such third-party owned material is clearly identified and acknowledged within the text or content of the submission.

**IF THE SUBMISSION IS BASED UPON WORK THAT HAS BEEN SPONSORED OR SUPPORTED BY AN AGENCY OR ORGANIZATION OTHER THAN NU, I CONFIRM THAT I HAVE FULFILLED ANY RIGHT OF REVIEW OR OTHER OBLIGATIONS REQUIRED BY SUCH CONTRACT OR AGREEMENT.**

NU will clearly identify my name(s) as the author(s) or owner(s) of the submission, and will not make any alteration, other than as allowed by this license, to your submission.

I hereby accept the terms of the above Author Agreement.

Axlu Kulmagambetova

April 29, 2022

**Declaration**

I, at this moment, declare that this submission is my work. To the best of my knowledge, it contains no materials previously published or written by another person or substantial proportions of material submitted for the award of any other course or degree at N.U. Or any other educational institution, except where due acknowledgement is made in the thesis. This thesis is the result of my independent work, except where otherwise stated, and the views expressed here are my own

Signed: Axlu Kulmagambetova

Date: April 29, 2022

**Ethical Approval**



53 Kabanbay Batyr Ave.  
010000 Astana,  
Republic of Kazakhstan  
12<sup>th</sup> October 2021

Dear Axlu Kulmagambetova

This letter now confirms that your research project entitled: Analysis of Factors Influencing Teachers' Instructional Practices and Innovation in Kazakhstan: Evidence from TALIS 2018 has been approved by the Graduate School of Education Ethics Committee of Nazarbayev University.

You may proceed with contacting your preferred research site and commencing your participant recruitment strategy.

Yours sincerely,



Dr Matthew Courtney

On behalf of Zumrad Kataeva  
Chair of the GSE Ethics Committee  
Assistant Professor  
Graduate School of Education  
Nazarbayev University

Block C3, Room 5006  
Office: +7 (7172) 70 9371  
Mobile: +7 777 1929961  
email: [zumrad.kataeva@nu.edu.kz](mailto:zumrad.kataeva@nu.edu.kz)

**CITI Training Certificate**



Completion Date 27-Sep-2021  
Expiration Date 26-Sep-2024  
Record ID 45330097

This is to certify that:

**Axlu Kulmagambetova**

Has completed the following CITI Program course:

**Students conducting no more than minimal risk research**  
(Curriculum Group)  
**Students - Class projects**  
(Course Learner Group)  
**1 - Basic Course**  
(Stage)

Under requirements set by:

**Nazarbayev University**

Not valid for renewal of certification through CME.



Verify at [www.citiprogram.org/verify/?wf9cff5f9-7e78-4104-9b09-0a9f7b9b6cbe-45330097](http://www.citiprogram.org/verify/?wf9cff5f9-7e78-4104-9b09-0a9f7b9b6cbe-45330097)

### **Acknowledgement**

Throughout the writing of this thesis, I received a lot of help and encouragement. First and foremost, I want to express my gratitude to my supervisor, Dr Matthew Courtney, for his fantastic assistance, unwavering support, and patience in teaching me how to use the R software. His sensible advice motivated me to extend my horizons and improve my work quality.

I'd like to express my gratitude to my husband and children for all they have done for me. It would have been difficult for me to finish my studies without their incredible understanding and encouragement during my first two years at NUGSE.

Finally, I'd like to express my gratitude to all the NUGSE professors and staff for providing me with such an outstanding education and experience.

**Abstract**

Teachers' instructional and professional practices can help students improve in school, and team innovation can help teachers improve their teaching. Based on the TALIS 2018 (Teaching and Learning International Survey) data, this study examines teachers' instructional approaches such as classroom management, clarity of instruction, cognitive activation, self-efficacy in teaching, and professional development in various Kazakhstani schools. Using confirmatory factor analysis and structural equation modelling, this study explores the links between instructional practice and innovation in Kazakhstan. Findings reveal that, in Kazakhstan, there exist few systematic disparities in teachers' preparation in classroom management and instructional practice between schools. Analysis reveals that instructional practice elements, such as self-efficacy in student engagement, clarity of instruction, and the need for professional development in subject matter and pedagogy, are major predictors of team innovativeness among teaching practitioners. In addition, the age group (maturity) and gender (being male) also contribute positively to the level of Kazakhstani team innovativeness among teachers in Kazakhstan. The research adds findings to a better understanding of the components that affect teachers' instructional and innovative practices in Kazakhstan and proposes approaches to improve educators' pedagogical and professional practices. Implications for policy and practice are discussed.

*Keywords:* teachers' instructional practice, classroom management, innovation, self-efficacy.

**Аннотация**

Педагогическая и профессиональная практика учителей может способствовать совершенствованию учащихся в школе, а командные инновации могут помочь учителям улучшить свое преподавание. Основываясь на данных TALIS 2018 (Международное исследование преподавания и обучения), данная работа рассматривает подходы учителей к обучению, такие как управление классом, ясность обучения, когнитивная активация, самоэффективность в обучении и профессиональное развитие в различных казахстанских школах. Используя подтверждающий факторный анализ и моделирование структурных уравнений, это исследование анализирует связи между учебной практикой и инновациями в Казахстане. Результаты показывают, что в Казахстане существует несколько систематических различий в подготовке учителей в области управления классами и учебной практики между школами. Анализ показывает, что элементы учебной практики, такие как самоэффективность в вовлечении учащихся, ясность обучения и необходимость профессионального развития в предметной области и педагогике, являются основными предикторами командной инновационности среди преподавателей-практиков. Кроме того, возрастная группа (зрелость) и пол (мужской пол) также положительно влияют на уровень инновационности казахстанской команды среди учителей в Казахстане. Исследование добавляет результаты к лучшему пониманию компонентов, которые влияют на педагогическую и инновационную практику учителей в Казахстане, и предлагает подходы к улучшению педагогической и профессиональной практики учителей. Рассматриваются последствия для образовательной политики и практики.

*Ключевые слова:* педагогическая практика учителей, управление классом, инновация, самоэффективность.

**Аңдатпа**

Мұғалімдердің педагогикалық және кәсіптік тәжірибесі оқушылардың мектепте дамып жетілуіне оң ықпал етеді, ал командалық инновация мұғалімдерге оқытуды жақсартуға көмектеседі. TALIS 2018 (Білім беру мен оқытудың халықаралық зерттеуі) деректеріне негізделе отырып, бұл зерттеу Қазақстан мектептеріндегі мұғалімдердің сыныпты басқару, оқытудың анықтығы, когнитивті активация, оқытудағы өзіндік тиімділік және кәсіби даму сияқты педагогикалық тәсілдемелерді қарастырады. Растаушы факторлық талдауды және құрылымдық теңдеулерді модельдеуді пайдалана отырып, бұл зерттеу Қазақстандағы оқыту практикасы мен инновациялар арасындағы байланысты талдайды. Зерттеу нәтижелері Қазақстанда мектептер арасында сыныпты басқару және оқыту практикасы саласында мұғалімдерді даярлау бойынша бірнеше жүйелі айырмашылықтар бар екенін көрсетіп отыр. Талдау көрсеткендей, оқушыларды тартудағы өзіндік тиімділік, оқытудың анықтығы, пән мен педагогикадағы кәсіби даму қажеттілігі сияқты оқыту практикасының аспектілері педагогтер арасында командалық инновацияның негізгі предикаторлары болып табылады. Сонымен қатар, жас ерекшелігі (есею) және жыныс (ер адам) Қазақстандағы мұғалімдер арасындағы командалық инновацияның деңгейіне оң әсер етеді. Зерттеу нәтижелері Қазақстандағы мұғалімдердің педагогикалық және инновациялық практикасына әсер ететін компоненттерді жақсы түсінуге үлес қосады, мұғалімдердің педагогикалық және кәсіптік практикасын жақсарту жолдарын ұсынады. Сондай-ақ, білім беру саясаты мен практика салдарын қарастырады.

*Кілт сөздер:* мұғалімдердің педагогикалық практикасы, сынып менеджменті, инновация, өзіндік тиімділік.

## Table of Contents

AUTHOR AGREEMENT .....	ii
Declaration.....	iii
Ethical Approval .....	iv
CITI Training Certificate .....	v
Acknowledgement .....	vi
Abstract.....	vii
Аннотация.....	viii
Аңдатпа .....	ix
List of Tables .....	xii
List of Figures .....	xiii
Chapter 1. Introduction .....	1
1.1 Introduction.....	1
1.2 Statement of the Problem.....	1
1.3 Purpose of the Study and Research Question .....	3
1.4 Significance of the Study .....	4
1.5 Outline of the Thesis .....	4
Chapter 2. Literature Review .....	6
2.1 Introduction.....	6
2.2 Framing the Literature Review .....	6
2.3 Theoretical Framework.....	7
2.4 Teachers Instructional Practices.....	8
2.4.1 Classroom Management.....	9
2.4.2 Summary .....	18
2.5 Innovation .....	18
2.5.1 Innovative Teaching Practices .....	19
2.5.2 School Climate for Innovativeness .....	21
2.5.3 Summary .....	23
2.6 The Role of Teacher Background Characteristics for Instruction and Innovation.....	24
2.7 Conclusion .....	26
Chapter 3. Methodology .....	28

## TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

3.1 Introduction.....	28
3.2 Research Design.....	28
3.3 Participants.....	29
3.4.1 Data Extraction and Preparation .....	30
3.5 Instrumentation .....	31
3.5.1 Independent, Control, and Dependent Variables .....	31
3.6 Data Analysis .....	35
3.7 Ethical Considerations .....	36
Chapter 4. Results .....	37
4.1 Introduction.....	37
4.2 RQ1: Measurement Model for Classroom Management and Instructional Practice in Kazakhstan.....	37
4.3 RQ2: Variance in Teachers' Preparation in Classroom Management and Instructional Practice Within- and Between Schools.....	40
4.4 RQ3(a): The Role of Teacher Preparation in Classroom Management on Instructional Practice and Innovation in Kazakhstan.....	40
4.5 RQ3(b): Parsimonious structural model best represents the role of teacher preparation in classroom management on instructional practice and innovation in Kazakhstan .....	42
4.6 Conclusion .....	44
Chapter 5. Discussion .....	45
5.1 Introduction.....	45
5.2 RQ1: Measurement Model for Classroom Management and Instructional Practice in Kazakhstan.....	45
5.3 RQ2: Variance in Teachers' Preparation in Classroom Management and Instructional Practice Within- and Between Schools.....	47
5.4 RQ3(a): The Role of Teacher Preparation in Classroom Management on Instructional Practice and Innovation in Kazakhstan.....	48
5.5 RQ3(b): Parsimonious Structural Model .....	49
5.6 Summary .....	51
Chapter 6. Conclusion.....	52
6.1 Summary of Research Findings .....	52
6.3 Recommendation for Future Research.....	53
6.3.1 Recommendation for Administration and Ministry of Education.....	54
References.....	55
Appendix A.....	68

**List of Tables**

Table 1. Selecting Categories based on Cooper's Taxonomy of Literature Reviews.....6  
Table 2. Independent Variables in the Current Study (Teacher-Level).....34  
Table 3. Control Variables in the Current Study (Teacher-Level).....35  
Table 4. School Principal Variables in the Current Study (School Level).....35  
Table 5. The Dependent Variable Adopted in the Current Study: Team Innovativeness...36  
Table 6. Model Fit Indices for Measurement.....39

**List of Figures**

Figure 1. Conceptual Mapping of Themes in TALIS 2018.....8

Figure 2. Classification of Items Related to Pedagogical and Professional Practices.....33

Figure 3. Teacher's Instructional Practices and Innovation in Kazakhstan Measurement Model.....40

Figure 4. Structural Equation Model with the Predictors of Team Innovativeness.....42

Figure 5. Structural Equation Model with the Predictors of Team Innovativeness (with Controls).....44

## **Chapter 1. Introduction**

### **1.1 Introduction**

Kazakhstan's government began implementing an updated curriculum in 2015, based on a constructivist ideology and a competence-based approach. Teachers were expected to embrace innovative teaching and assessment methods to strengthen learners' cognitive and creative thinking skills. Research has suggested that it is helpful for teachers to transition to and from pedagogical approaches that include both teachers- and learner-centred approaches to develop creative and critical thinking skills (Dignath et al., 2008). Moreover, Brophy (2011) points out that "Physical setting, task flow, and discourse management need to be designed to create optimal implementations of the intended curriculum" (p. 18). Teachers should plan each part of the lesson, reflect on how they may improve their teaching, and then implement the national curriculum, and fulfil each learner's needs. This is because "classroom life involves planning the curriculum, organising routine procedures, gathering sources, arranging the environment to maximise efficiency, monitoring student progress, and anticipating preventing, and solving problems" (McLeod et al., 2003, p. 6). Therefore, teachers' instructional practice and innovation could be one aspect supporting the successful implementation of the new curriculum and improving teacher readiness in Kazakhstan's universities and colleges.

### **1.2 Statement of the Problem**

Pedagogical colleges and universities in Kazakhstan graduate thousands of novice teachers. Nonetheless, it is sometimes maintained that not everyone develops the requisite practical teaching skills to function in a school setting. As Cyril and Raj (2017) stated, "... many teachers embark on their career without having mastered an effective approach to managing students in the classroom" (p. 26). Specifically, when novice teachers arrive at Kazakhstan's schools, research has suggested that "they struggle with teaching effectively and

at the same time with establishing and maintaining classroom management and discipline" (Shamatov, 2005, p. 2).

The term "classroom management" is replaced in Kazakhstani pedagogical literature with the phrase "controlling the class," which excludes essential aspects of classroom management, such as initial classroom management strategies, anticipating and managing issues before they arise (Kounin, 1970), and related themes (see, for example, Rogers, 2011). Classroom management is the subject of a large body of theoretical and empirical research that helps educators understand their roles in the classroom. According to Evertson and Weinstein (2011), "classroom management is the action teachers take to create an environment that supports and facilitates both academic and social-emotional learning" (p. 4). Unfortunately, in Kazakhstan's educational context, there is a scarcity of research or theories on classroom management.

However, Kazakhstan's TALIS 2018 (OECD, 2019a) results reveal many issues related to teachers' classroom practices. In addition to the wide-ranging suite of questions designed to explore teaching methods in the teacher-based TALIS survey instrument, multiple questions also focus on classroom management and the setting of lesson goals. Descriptive statistics provide some insight into teachers' pedagogical practice in Kazakhstan. For instance, 92% of teachers report explaining how new and old topics are connected (OECD average 84%). However, in terms of classroom management, only 42% of teachers claim that they often have to calm students who violate disciplinary rules (OECD average 65%). Results from the 2018 TALIS survey provide insight into developing students' cognitive activity: in OECD countries, about half of teachers use such methods. In particular, 75% of teachers noted that they often ask students to find their ways to solve complex problems, compared with 45% in OECD countries. Finally, during a regular lesson, teachers spend an average of 79% of their time teaching and learning, which is slightly higher than the

OECD average (78%). However, little is known about how classroom management and instructional practice might be related.

In Kazakhstan, there is a lack of research on instructional practice (for example, classroom management) and teachers' use of innovation. As a result, the current study examines the role of instructional practice and the implementation of innovative teaching techniques in Kazakhstan to contribute to national knowledge of the relationship between instructional practice and innovation. The outcomes of this study could help educators and stakeholders develop teacher preparation courses and training at the school and institutional levels. Furthermore, teachers will benefit from reflecting on these findings regarding their practices and classroom management approaches. The research findings will also contribute to the knowledge base in Kazakhstan and internationally by filling a gap in the literature.

### **1.3 Purpose of the Study and Research Question**

This study examines teachers' instructional practice and innovation in Kazakhstan using the 2018 Teaching and Learning International Survey (TALIS) cycle data. According to OECD (2019b), "TALIS describes the conditions of teaching and learning, as well as the functioning of education structures, thus offering a means of comparing approaches to teaching and school leadership" (p. 35). The following questions will be discovered in this research:

How do teachers' background, teaching preparation, and context (e.g., gender, age, experience; school type, urban-rural, school language of instruction) influence teachers' instructional practice and innovation in Kazakhstan?

**RQ1:** What measurement model best represents preparation in classroom management and instructional practice and innovation in Kazakhstan?

**RQ2:** To what extent does teachers' preparation in classroom management and instructional practice vary within- and between schools?

**RQ3(a):** What structural model best represents the role of teacher preparation in classroom management on instructional practice and innovation in Kazakhstan?

**RQ3(b):** Controlling for covariate effects, what structural model best represents the role of teacher preparation in classroom management on instructional practice and innovation in Kazakhstan?

**Hypothesis:**

The teachers' background and preparation factors significantly impact teachers' instructional practice and innovation in Kazakhstani educational context.

**1.4 Significance of the Study**

Teachers' instructional practices can influence school outcomes, whereas team innovativeness can maintain and enhance teaching. This study explores teachers' instructional techniques such as classroom management, clarity of instruction, cognitive activation, and promoting students' cross-curricular skills in Kazakhstani schools using secondary data from the TALIS 2018. Moreover, the relationships between instructional practice and innovation in Kazakhstan will be explored. Hence, the findings of this thesis might be helpful for educational institutions, local universities, schools, and local administrations in providing courses and seminars, in conducting further research on the pedagogical and professional development of teachers, and capacity building.

**1.5 Outline of the Thesis**

This introductory section provides a brief overview of teachers' instructional practices and innovation in Kazakhstani schools. In Chapter 2, a framework for the literature review and the conceptual framework of TALIS 2018 themes. Teachers' instructional practices, classroom management, clarity of instruction, cognitive activation, feedback to students, assessment strategies, developing students' cross-curricular skills, and teacher self-efficacy

## TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

will all be considered in the literature review. This study's methodology is described and discussed in the methodology part. The research findings and outcomes will be reported in Chapters 4 and 5. Finally, the study's findings will be discussed.

## Chapter 2. Literature Review

### 2.1 Introduction

This chapter reviews the literature relating to teachers' instructional practices and innovation. It begins by framing the literature review and explaining the conceptual framework of TALIS 2018 themes. It then examines and synthesises the literature on teachers' pedagogical practices and is divided into three sections: teachers' instructional practices, innovation, and the role of teacher background characteristics for instruction and innovation.

### 2.2 Framing the Literature Review

To provide a framework for the literature review, this thesis made use of Cooper's Taxonomy of Literature Reviews. The framework includes six characteristics of a literature review and provides various options to select categories for each part. The six characteristics include focus, goal, perspective, coverage, organisation, and audience (Randolph, 2009).

**Table 1**  
*Selecting Categories based on Cooper's Taxonomy of Literature Reviews*

Characteristics	Selected categories
Focus	Research outcomes
Goal	Integration: (a) Generalization
Perspective	Neutral Representation
Coverage	Central or Pivotal
Organisation	Conceptual
Audience	General Scholars; Practitioners or Policy Makers

*Note.* This table is adapted from "Organizing Knowledge Synthesis: A Taxonomy of Literature Reviews," by H. M. Cooper, 1988, *Knowledge in Society*, 1, p. 109. Copyright by Springer Science + Business Media. It was adapted with the permission of Springer Science + Business Media. As cited in J. Randolph "A Guide to Writing the Dissertation Literature Review," 2009, *Practical Assessment, Research and Evaluation*, 14, p. 3.

Research outcomes were chosen as the focus of the literature reviewed because they were analysed and synthesised using recent and available research results. According to Randolph

(2009), "an outcomes-oriented review may help identify a lack of information on a particular research outcome, thus establishing a justifiable need for an outcome study" (p. 2).

The goal of the literature review is to generalise the main findings and integrate them via entities, results, and settings. This study follows the quantitative tradition and attempts to maintain a neutral position in terms of perspective. In terms of coverage of the literature, only central or pivotal work is selected in this paper because teachers' instructional and innovative practices are one of the understudied areas in Kazakhstani education. The ideas and theories about instructional and innovative methods for educational organisations are introduced conceptually throughout the literature review. The intended audience of the literature review includes general scholars, practitioners, and policymakers to gain insights into teachers' pedagogical and professional practices.

### **2.3 Theoretical Framework**

The conceptual framework of TALIS 2018 themes consists of two dimensions: focus and level (Figure 1). The first dimension (focus) is more related to articles covering institutions or teachers' professional characteristics or pedagogical practices. The second of the two dimensions (level) focuses on issues related to institutions or teachers, with the institutional level referring to a school or regional system.

Teachers' instructional practices and professional practices are considered a pedagogical core of schooling. Therefore, focusing on teaching and learning involves two components at the teacher level. This research looks into various characteristics of teachers' instructional techniques, including instructional practices and innovation. Institutional and teacher-level innovation can be conceptualized, embracing both the school environment and teaching approaches.

**Figure 1**  
*Conceptual Mapping of Themes in TALIS 2018*

Focus/ Level	Teaching Profession (professional characteristics) (focus)	Teaching and Learning (pedagogical practices) (focus)	
Institutional (level)	Human resource issues and stakeholder relations	School climate	
		School leadership	
Teacher (level)	Teacher education and initial preparation	<b>Innovation</b>	Equity and diversity
	Teacher job satisfaction and motivation		
	Teacher feedback and development	<b>Teacher's Instructional practices</b>	
	<b>Teacher self-efficacy</b>		

*Note.* Words in bold represent focal areas of the current study; innovation is conceived at both the teacher and institutional levels.

This study focuses on human resources and stakeholder relations, teacher education and initial preparation, and teacher self-efficacy regarding the teaching profession and professional qualities. Human resources and stakeholder relations are considered institutional issues. Finally, the lower-left quadrant of this study's focus on issues like teacher education and preliminary preparation and teacher self-efficacy will provide insight into the role of teacher background, beliefs, and attitudes toward innovativeness.

## 2.4 Teachers Instructional Practices

As was pointed out in the introduction to this paper, teachers' instructional practices are a pedagogical foundation for teaching and learning. Regarding the OECD (2018), "effective instructional practices encompass, for example, classroom management, teacher support, clarity of instruction, and cognitive activation" (p.54). Moreover, Klieme et al. (2009) indicate (a) clear and well-structured classroom management, (b) a supportive and student-

oriented classroom climate, and (c) cognitive activation with challenging content are three core elements of instructional quality.

However, other scholars have argued that these classifications are not helpful, and that teaching cannot be simplified. For example, according to Vieluf et al. (2012), instructional quality is complicated because there is no single best approach to teaching. Educators should adapt their pedagogical practices to handle the particular context, class, and students. Other scholars have argued that effective instruction depends on the classroom's goals and specific needs at the time. For example, Nikandrov (2014) states that "Whatever we take as our teaching goal (the Bloomian cognitive, affective and psychomotor domains, level of assimilation of knowledge, or particular tasks to be performed by students after learning), it should be made intelligible and—as far as possible--acceptable to students" (p. 258).

The instructional practice has been conceived and classified in multiple ways. Essential connections exist between school and classroom climate, classroom management, instructional clarity, and student cognitive activation. As it is central to this study, attention will be given to the different classroom management theories and findings at this juncture.

#### **2.4.1 Classroom Management**

Classroom management is an essential pedagogical device for organizing learning processes and building fundamental knowledge. This section will describe the concept and styles of classroom management. Classroom management issues related to Kazakhstani education and the main effective teaching techniques will also be discussed.

Classroom discourse studies describe classroom management from different perspectives. According to Morine-Dersheimer (2011), from a sociolinguistic perspective, classroom practices may support teachers to enhance students' social skills and levels of self-regulation, while from the cognitive constructivist perspective, using group management techniques can

promote student participation in academic activities. Also, based on sociocultural studies research, Morine-Dershimer (2011) suggests that certain classroom practices can help educators "develop caring, supportive relationships with and among students" (pp. 153-154). From the critical discourse analysis perspective, classroom management is associated with using appropriate interventions to help learners with behaviour issues.

Furthermore, different academics develop various classroom management models. Authoritarian, authoritative, laissez-faire, and indifferent classroom management styles were identified by Bosworth (1997). Similarly, scholars Glickman et al. (1980) provide an alternative model that describes teachers' perceptions of professional classroom management styles: the interventionist, non-interventionist, and interactionalist types. The interventionist style is related to the teacher who adopts a teacher-centred approach, whereas non-interventionist teachers apply student-centred methods. By finding a medium ground between interventionists and non-interventionists, interactionalist teachers hope to please both themselves and their students. These classification types may help us anticipate teaching and learning processes in the classroom—also, they may help us recognise the obstacles in teaching, practices, and interactions with learners.

It is essential to bear in mind the teacher preparation issues in Kazakhstan's pedagogical universities, and teacher training centres since many disciplines are based on theory, and less time is afforded to practice. Stough (2006) argues that "despite the value with which teachers hold it, training in classroom management has never been a requirement of teacher preparation programs to the same degree as has, for example, coursework in reading instruction" (p. 913). This view is supported by Roache and Lewis (2011), who state that when teacher education systems concentrate on classroom management's theoretical side, novice teachers can experience shock in the classroom. For instance, novice teachers face problems connected with lesson planning, teaching process management, and building

rapport with learners (Shamatov, 2006). Also, in Kazakhstan, research has suggested that most teacher trainees receive less support from their more experienced colleagues in terms of classroom management.

Anecdotally, teachers' attitudes towards and perceptions of managing the classroom are different in Kazakhstan compared to the West. In this author's experience, in practice, in Kazakhstani schools, most teachers strictly control class discipline and misbehaviour. Moreover, the vice-principals often hold school noise during lessons and break times. It is assumed that if you have a problem with discipline, you are not a good teacher. According to Kounin (1970), the secret to classroom management is anticipating student disruption by supporting classroom activities and preventing conflicts before they arise. Furthermore, regarding Garret (2014), educators frequently accept that a well-managed classroom is equivalent to a regulated and peaceful workplace. However, because learning is not always passive, an effective learning environment might include noise levels. Korpershoek et al. (2016) concluded that interventions aimed at students' socio-emotional development were somewhat more effective than treatments lacking this component in their meta-analysis on effective classroom management. This component aided socio-emotional results in particular.

The literature offers several options for dealing with student behaviour. For example, some suggestions for dealing with disruptive pupils during class included ignoring them, trying not to pay attention to them, or using punishments such as forcing kids to stand in the corner. Rules, praising, and ignoring were the school system's behaviorally based classroom management mantras, according to Brophy (2011). However, it has been claimed that rather than simply regulating students' behaviour, classroom management practices must be accepted as a way to increase their learning (Eisenman et al., 2015). As a result, the frequent employment of reactive approaches may be due to a lack of understanding of the usefulness of anticipatory strategies (Peters, 2012).

More broadly, classroom management can be conceived as a broad set of strategies that improve classroom learning. According to Garret (2014), the primary components of classroom management are organizing the physical design of the classroom, setting up norms and routines, developing caring partnerships, engaging and practical instruction, and monitoring discipline issues. Gettinger and Kohler (2011), on the other hand, define classroom management practices as slightly different. Classroom regulations, easy transitions between activities, beginning-of-year management activities, efficient use of learning time, student performance monitoring, and communicating classroom behaviour awareness are among them.

Furthermore, Scheerens (2008) proposes five variables that help students learn better: classroom management and time on task, structure, classroom atmosphere, individualized and adaptive education, and feedback. A more detailed account of classroom management, such as clarity of instruction, cognitive activation, feedback, assessment, timing, equity, and diversity, is given in the following section. As previously stated, time and effort spent improving problem-solving and increasing one's knowledge base are two of the most crucial components influencing learning achievement (Ericsson et al., 1993).

According to Holzberger et al. (2013), there is a link between teachers' instructional efficacy and teaching quality. It was discovered that instruction efficacy could predict teacher-reported teaching practices linked to student assistance ( $\beta=0.24$ ,  $p<0.05$ ) rather than cognitive activation ( $\beta=0.14$ ,  $p=0.11$ ) or classroom management ( $\beta=0.1$ ,  $p=0.14$ ). However, teaching practice can better explain instruction effectiveness, whereas the effectiveness of instruction can be predicted by classroom management ( $\beta=0.29$ ,  $p<0.05$ ).

*2.4.1.1. Clarity of Instruction.* Quality of instruction is one of the primary dominant components of arranged students' learning and accomplishment (Hattie, 2009; Hill et al.,

2005). "The primary task of classroom instruction as an institutionalised and planned teaching and learning situation is to initiate and support insightful learning processes—that is, to facilitate students' active and independent engagement with new and existing knowledge" (Kunter, & Voss, 2013, p. 98). Instruction can be divided into two aspects: surface structures and deep structures. The first aspect can be observed directly, whereas the second aspect needs interpretations that account for the number of suggestions gone to the observer (Schlesinger & Jentsch, 2016). Particularly, high-quality instruction can be a consequence merely of productive communication between students and teachers (Baumert & Kunter, 2006). While even the most effective instructions can only help some students learn, active learning chances are always dependent on the students themselves (Rakoczy et al., 2007; Shuell, 1996).

In addition, Schwichow et al. (2016) conducted a meta-analysis of the control-of-variables strategy where 72 studies were analysed from 1972 to 2012. The researchers established instruction characteristics that significantly moderate the effect size. Instructional interventions that used demonstrations of excellent experiments exhibited significantly larger effect sizes ( $g = 0.69$ , 95% CI = 0.57–0.81) than studies that did not employ demonstrations ( $g = 0.48$ , 95% CI = 0.32–0.64). Interventions with actions to actuate cognitive disagreement in students had larger effect sizes ( $g = 0.80$ , 95% CI = 0.62–0.98) than interventions not utilizing such practices ( $g = 0.53$ , 95% CI = 0.43–0.63). Schwichow et al. (2016) suggest that teachers can draw students' attention by contrasting strong and weak experimental examples.

In particular, "achievement is maximised when teachers: (a) emphasise instruction as basic to their role, (b) expect students to master the curriculum, and (c) allocate most available time to academic activities" (Brophy, 1988, p. 240). Close monitoring, appropriate pace and classroom management, organization, clarity of delivery, instructive and powerful feedback

are all part of direct instruction. These elements contribute to a well-organized atmosphere and maximize learning time (Vieluf, Kaplan, Klieme & Bayer, 2012).

*2.4.1.2 Cognitive activation and fostering students' cross-curricular skills.* Learning is one of the few human activities requiring the least outside intervention. The majority of learning, however, does not occur as a result of instruction; instead, it occurs due to unrestricted engagement in a relevant situation. Nonetheless, education forces students to track their own cognitive development through meticulous planning and manipulation (Illich, 1971). Furthermore, according to Kunter and Voss (2013), the assignments are built on students' past knowledge and might challenge current notions by pushing students to link known material or apply this knowledge in new ways.

The concept of "knowledge" refers to the cognitive basis of different competence. According to Schneider and Stern (2010), "while some of these competencies are brittle and limited, others are broad, flexible and adaptive – depending on the cognitive organisation of the underlying knowledge" (p. 71). From a social constructivist point of view, knowledge develops in communication with others: interacting with different assumptions and projections of view and overcoming inconsistencies is a proper way to create a deep understanding of the subject (Cobb, 1994; Palincsar, 1998; Sfard, 1998). Tobias and Duffy (2009), on the other hand, suggest that the hope that social constructivist education will improve student learning is based on the reduction of superficial learning environment aspects and deep cognitive processes. It is possible that lecture-style teaching, rather than autonomous or collaborative learning, adds to a greater understanding of students. Students in the first situation are guided and supported, whereas students in the second case are not.

Cognitive and non-cognitive skills, which are among the skills of the 21st century, are considered especially important for success in school and at work. Critical thinking, digital

competence, and problem-solving have been emphasized by researchers and policymakers as vital lifelong learning abilities, owing to the increased complexity of work- and real-life problem scenarios (Griffin et al., 2012; Greiff et al., 2015). PISA has recently expanded its focus on 21st-century skills relevant in all fields, apart from traditional science, mathematics, and reading assessment in each cycle. For example, in the PISA 2012 cycle, the measure of creative problem-solving skills was included as an international option (OECD, 2014). Moreover, in PIAAC, adult competencies also include measures of problem-solving skills (OECD, 2009). Consequently, the importance of 21st-century skills in large-scale evaluations and sectors of education policy, such abilities are usually measured as necessary to the modern workforce with recommendations for study and practice (Autor et al., 2003).

Problem-solving is defined as "an individual's capacity to use cognitive processes to resolve real, cross-disciplinary situations where the solution path is not immediately obvious" (OECD 2004, p. 156). Regarding the prediction of problem-solving competence, Scherer and Beckmann (2014) discovered that math and science competence are strongly related to students' performance in analytical problem-solving in most nations. In contrast, it is notable that science competence did not significantly predict problem-solving competence for some below-average performing countries. It is reasonable to conclude that in these countries, education is more concentrated on mathematical education and the modelling process, with less emphasis on problem-solving in science (Janssen, & Geiser, 2012). Finally, Greiff et al. (2014) address three main issues in this field: (a) raise awareness of the presence and usefulness of domain-general problem-solving abilities among relevant stakeholders; (b) improve how such skills may be measured; (c) investigate approaches to encourage students to develop and keep these skills.

*2.4.1.3. Assessment strategies and feedback.* Many of the arguments concentrate on what we assess, how we assess, and how assessment data is used to impact educational practice

(Lau, 2016; Pellegrino, 2016). Thus, the assessment of competencies should both document the competencies of students, at the same time, help develop them by adapting the practice of teachers and the focus of curricula (Pepper, 2013). If the summative assessment does not explicitly include key competencies, it may restrict the curriculum and learning (European Commission, 2012).

Moreover, comprehensive teacher training is also required for effective summative assessment delivery (Crossouard, 2011; Pepper, 2013). Siarova et al. (2017) suggest that "collaborative learning environments can be effective tools to support teachers at all stages of the teacher education continuum in enhancing their assessment literacy" (p. 53). Nevertheless, some research outcomes indicate that summative evaluation methods, including standardised tests, can lead to bias in student performance, relying on the experience of the students (Klapp, 2015). Therefore, reforming summative evaluation techniques primarily based on grading by integrating them with formative strategies could additionally assist the getting to know the process of offering the identical possible growth to all learners, focusing on their proper competencies instead of on constructed shortcomings (Terrail, 2016).

Several types of research were conducted to evaluate the role of feedback in learning and teaching. Regarding Ramaprasad (1983), "feedback is information about the gap between the actual level and the reference level of a system parameter which is used to alter the gap in some way" (p. 4). Black and Wiliam (1998) emphasise that assessment is considered formative when assessment information improves student achievement. Further, formative assessment can enable learners to become "formative decision-makers" (Brookhart, 2011, p. 4).

A meta-analysis of 21 special reports on the practice of receiving feedback from teachers at intervals of 2 to 5 times per week was undertaken by Fuchs and Fuchs (1986). The mean effect size was 0.70 standard deviations between the experimental and control groups.

The effect was more substantial (mean effect size: 0.70) in research where teachers documented individual students' progress as a guide and stimulus than in studies where teachers did not (mean effect size: 0.26). In the current research, Wiliam (2010) found that an effect size of roughly 0.4 indicates a learning rate increase of at least 50% on standardised achievement measures, which are typical of feedback studies. In other words, kids learnt what other students took a year to learn in just eight months. Therefore, assessment could be employed "to provide feedback and correctives at each stage in the teaching-learning process" (Bloom, 1969, p. 48).

*2.4.1.4 Teacher self-efficacy and teaching practices.* It is assumed that self-efficacy is based on what a person, in his opinion, can do with the skills they possess, and not their actual level of competence (Woolfolk & Burke, 2005). Efficiency is a crucial dynamic of the psychological state of a person. Still, it may be overestimated or underestimated. These assumptions may have consequences for the actions that a person undertakes in resource and energy costs for striving to achieve a goal (Woolfolk & Burke, 2000). The personal development of self-efficacy depends on the individual's ability to question the skills associated with success or failure at a task and learn new inclusive systems that help develop personal effectiveness on specific tasks (Bandura, 1993). Kunin (1970) identified three factors that can be studied to understand better how teacher effectiveness can be viewed when considering each factor: planning and preparation, classroom environments, and instruction.

Teacher self-efficacy is typically assessed by asking respondents to select whether they believe they can or cannot perform various instructional tasks (O'Neill, & Stephenson, 2011). Furthermore, according to Bandura (1997), tasks may differ in complexity, and self-efficacy assessments may differ by level; the skills and tenacity needed to perform a task in a specific environment are future-oriented and motivated by goal setting. In their meta-analysis, Steven and Hansel (2015) analyzed data from 33 research, including 16,122 preservice and in-service teachers from North America, Europe, Asia, and Australia. The findings of this meta-

analysis represent that teachers' self-efficacy views before and after work are favourably associated with their commitment to the teaching profession ( $ES = +0.32$ ). Self-efficacy accounts for 10% of the variance in teacher decisions to enter, stay, and leave the job. As a result, teachers should have a strong pedagogical understanding of teaching methods, as well as a thorough knowledge of the subject they teach and a sense of how students construct knowledge in the subject area (Schulman, 1987). Hence, teacher education programs and professional development training should equip future and present teachers with a variety of abilities and experiences to fulfil the requirements of their learners (Tschannen-Moran & McMaster, 2009).

#### **2.4.2 Summary**

Theoretical and empirical findings on classroom management are presented in this section. It was shown that instruction efficacy could consistently predict teacher-reported instructional methods associated with student assistance. In addition, it was found that teaching practice was strongly associated with teaching effectiveness, and classroom management was also strongly associated with instruction effectiveness. A summary of the literature also revealed the benefits of providing feedback where teachers recorded individual students' progress as a guide and stimulus. To sum, these findings all imply that teacher self-efficacy is essential for the retention of teachers in the profession and that teachers should have established a solid pedagogical basis before entering the classroom. The following section describes the role of innovation in classrooms and schools.

#### **2.5 Innovation**

Innovation now plays a crucial role in every aspect of human life. It is mainly associated with intelligent technologies, and innovative persons tend to become more valuable in society since they are open to new ideas and take more risks. Hurt et al. (1977) stated that "the wider

an individual's category width, the more receptive an individual will be to an innovation" (p. 58). This means that those with broad multidisciplinary experience are more likely to innovate. There is no exception for educators either because innovative teaching practices can positively impact learning outcomes and provide opportunities for building professional teaching communities. This section will discuss the concepts of innovation and innovativeness and their role in education systems and teaching practices. Moreover, the school climate for innovativeness in education will be analysed.

### **2.5.1 Innovative Teaching Practices**

There are various interpretations of what innovation is itself and what characteristics individuals should exhibit to be innovative. According to Rogers (2003), innovation is "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p. 12). Moreover, another important aspect of innovation, according to Kirkland and Sutch (2009), is a new idea or a further development of an existing product, technique, or approach that is applied in a specific environment to provide added value. Significantly, in educational contexts, innovative ideas can help teachers tackle the problems in their practice, enhance learning outcomes, and take leading roles, among others. However, innovation must be characterised by the people's thoughts and actions to whom it is directed (Katz, 1961).

Furthermore, depending on the source, the term "innovativeness" can be described differently. It can also be described in terms of specific types of personal characteristics or traits of individuals. From the psychological perspective, "specific motivational states, neurocognitive, and personality traits, as well as social environments, affect the three related components of novelty-seeking, creativity and innovative performance" (Schweizer, 2006, p. 164). At the same time, Hurt et al. (1977) claim that "a definition of innovativeness as a normally distributed, an underlying personality construct, which may be interpreted as a willingness to change" (p. 59). Also, Feaster (1968) supports this idea and claims that

innovativeness should be mindful of the need to enhance or a positive state of mind toward change. In contrast, Rogers and Shoemaker (1971) conceptualise innovativeness as the degree to which a person is generally an early adapter in embracing developments concerning others within the social framework. Similarly, early adopters and innovators are willing to take a chance on a fresh idea before other members of the system (Moore, 1999; Rogers, 2003).

As educational systems have evolved, philosophical views and pedagogical ideas, and attitudes to innovation in teaching practices have also changed. Nikandrov (2014) argues that "whenever and wherever an educational innovation (or would-be innovation) does spring up, sceptics will always find that something similar has already existed" (p. 252). In their paper, Vieluf et al. (2012) described different philosophies in learning and teaching and how these views shaped teaching practices: behaviourism, the Gestalt approach, cognitivism, constructivism. According to behaviourists, complex behaviour can be taught using general refining practices one step at a time until the entire behaviour sequence is complete. However, in the Gestalt approach, behaviourism was scrutinized for breaking down behaviour into its parts. Instead of repetitive enhancement of stimulus-response linkages, learning is viewed as a preparation for comprehending the structures of situations and picking up spontaneous insight.

Moreover, cognitive psychology, appearing in the middle of the 20th century, "examines mental processes and knowledge structures. It tries to understand how knowledge of different themes is acquired and structured and which strategies are used for problem-solving. Learning is seen as acquiring knowledge" (Vieluf et al., 2012, p. 28). Nevertheless, these approaches do not abdicate numerous innovative approaches for educating.

On the other hand, constructivism takes a more student-centred approach to teaching. Teachers are considered as facilitators of active, self-directed knowledge building rather than

direct transmitters of knowledge in these approaches. Another theory, socio-constructivism, emerged in the late twentieth century, motivated by Vygotsky's concepts and the culturally comparative approach (Vieluf et al., 2012, pp. 28-29). Whereas constructivism portrayed learning as a process happening inside the confined intellect of a person, the socio-constructivist view knowledge as arranged and "being in part a product of the activity, context, and culture in which it is developed and used" (Brown et al., 1989, p. 32). The latest approach suggests many practices for innovative teachings, such as self-directed learning, cooperative learning, guided discovery, scaffolding, problem-based learning, and project-based learning, among various other approaches (Vieluf et al., 2012).

### **2.5.2 School Climate for Innovativeness**

Innovation in education is not only driven by individuals but also by the school community. According to the National School Climate Council (2007), the school climate influences the quality of students' interactions with instructors, guardians, and school personnel. It represents the educational and social missions of the organization through its standards, beliefs, and ambitions. As a result, four social relationships prevent each individual from engaging in delinquent behaviour: attachment, commitment, engagement, and belief (Agnew, 1993; Hirschi, 1969). However, Andrews (2007) argues that "Many organisations only measure revenue, profits, and market share. These are easier to quantify than intangibles such as reputation, knowledge, attractiveness to talent, leadership, and other assets that contribute true value" (p. 19).

The school environment and professionalism of the staff also play a crucial role in identifying and adopting new ideas since, without supporters, innovative ideas will not flourish. As a result, each person exposed to imaginative role models advantages in their improvement (Bandura, 1977; Simonton, 1975). Schweizer (2006) supports this idea and claims that "Individuals can display novelty-seeking and creative behaviour, but only the

judgment by others may label the results from this behaviour is new, that is: 'innovative'" (p. 166). Alternatively, Midgley and Dowling (1978; also see Midgley, 1977) portray innate innovativeness as "the degree to which an individual makes innovation decisions independently of the communicated experience of others" (p. 235). Educators in more created learning communities acknowledge different imaginative practices to exchange with the controlling and empowering components in their demanding settings. Numerous of these practices are conceivably helpful in supporting other schools (Bolam et al., 2006).

Collaboration within professional learning communities is vital for innovative schools. Mun et al. (2006) concluded that "Collectively, the innovation diffusion research indicates that earlier adapters are more likely to adopt a technological innovation due to their innovativeness" (p. 395). Furthermore, a professional learning community recognizes the unit of individual commitment and analyses practice in a dynamic, intelligent, collaborative, wide-ranging, learning-oriented, growth-promoting mode (Toole & Lewis, 2002). According to Louis et al. (1995), professional learning communities have five fundamental characteristics: shared values and vision, collective responsibility, reflective professional inquiry, and teamwork. Inadequate finance, risk avoidance, siloing, time commitments, and inappropriate measures, regarding Andrews (2007), are five hurdles to innovation.

In recent studies, Cakir (2021) investigated the relationship between the level of innovative competence of school principals and the level of innovative practice in schools (based on the opinion of teachers working in Vocational and Technical Anatolian High Schools). It was determined that there was a moderately positive and significant relationship between the innovative competencies of school principals and the innovative level of schools ( $r = .578, p < 0.01$ ). Following these results, it can be said that as the innovative competencies of school administration increase, the level of innovation in schools also improves. Moreover, in the same study, the average score of male teachers' opinions about

the sensitivity of school principals to changes ( $M = 3.84$ ,  $SD = 0.59$ ) was statistically significantly higher than the average score of female teachers' opinions of the same topic ( $M = 3.60$ ,  $SD = 0.88$ ). Therefore, the role of teacher gender may also need to be explored in research on innovative practice.

The moderating influence of innovation culture in the link between organizational learning and innovation performance was investigated by Ghasemzadeh et al. (2019). The findings revealed that organizational learning had a moderating effect on product innovation ( $b = .22$ ,  $p < .010$ ), process innovation ( $b = .23$ ,  $p < .010$ ), and objective innovation ( $b = .40$ ,  $p < 0.10$ ). These findings revealed that product and process innovation are favourably and strongly connected with organizational learning and innovation culture. However, the researchers found that organizational learning is a more relevant predictor than innovation culture in describing product innovation. When it comes to explaining the process of innovation, innovation culture is a better predictor than organizational learning. However, little research has explored the antecedents of innovative practice in educational contexts. This could be considered a major gap in the literature.

### **2.5.3 Summary**

So far, this subsection of the thesis has focused on innovative pedagogical practice. Constructivism, portrayed primarily as a learning process, was suggested as an approach to delivering a more student-centred approach and innovative concepts to education. Furthermore, research suggests that teacher support, innovative practices, and collaboration within professional learning communities are crucial for innovative schools. Moreover, the innovative competencies of school principals and the innovative level of schools were found to have a somewhat reasonable and substantial association. The researchers discovered that organizational learning is a more meaningful predictor than innovative cultures in characterizing product innovation. When explaining the innovation process, an innovative

culture outperforms organizational learning. However, very little research has been done on the factors influencing innovation practices in educational settings. This might be seen as a significant gap in the literature. The following section will discuss teachers' characteristic factors which have influenced teachers' instructional and innovation practices.

## **2.6 The Role of Teacher Background Characteristics for Instruction and Innovation**

As regards OECD (2018), "the background information collected should also reveal basic characteristics likely to be of interest in terms of their relationship to other indicators" (p. 66). This section will discuss the relationship between pedagogical practices and teachers' characteristics such as teachers' age, gender, teaching experiences, level of formal education, self-efficacy. Also, brief information about Kazakhstani teachers background characteristics will be given.

Savina (2019) claims that the possession of relevant knowledge is the basis for the emergence of new ideas on which all innovative activity is based; therefore, academically highly qualified teachers are more likely to be more resourceful. Moreover, Owusu and Yiboe (2013) established how the three traits of a teacher (academic qualifications, teaching experience and perception) predicted the adoption of the French syllabus. It so happened that only the academic qualification of a teacher had a statistically significant association with innovation, with a regression model that gave B value 0.857,  $p = 0.044$ .

Teachers' sense of effectiveness likely influences the teaching practice and policies they use in the classroom (Wolters & Daugherty, 2007). The confirmatory factor analysis results showed that the first-order three-factor structure offered a robust model, thus supporting build validity. Three latent factors were identified: a) effectiveness in student engagement, b) effectiveness of instructional strategies, and c) effectiveness in the classroom (Aikaterini, & Belias, 2016). Furthermore, Thieman (2000) identified factors that impact teachers to change their classroom practices in response to education reform as (among other variables) current

and previous teaching experience, pedagogical knowledge to implement curriculum reform and self-efficacy. Notably, Poulou (2007) reveals that self-efficacy predicts essential qualities, motivation, and classroom management skills.

The experimental data are somewhat controversial, and there is no general agreement about teacher education level, gender, or age. It was found that the female gender and more extended teaching experience likely predict higher teacher performance (Lin et al., 2002; Mertler, 2004). However, Aikaterini and Belias (2016) conclude that male primary school teachers older than 44 years old, with over 16 years of teaching experience, seem to have stronger convictions about their ability to manage student behavior. Those teachers can deal with extreme pressure situations, help their students meet the desired level of academic achievement and ensure that their students learn from teaching material.

Labone (2004) states that the highest levels of effectiveness were observed among the most experienced teachers. Although long-serving teachers may retain an optimistic professional outlook, as they mature, they face difficulties coping with the demands of teaching and changing individual situations and adapting to change due to the added responsibility of managing (Webster et al., 2012). Tumova (2012) confirms that the influence of teachers' age and professional experience on readiness to accept curriculum reform. The result showed that teachers' professional experience of more than 15 years resisted new teaching methods. At the same time, novice teachers may be slow to embrace educational innovations because they believe they are not adapted and not adequately called upon to solve the problem. For this reason, situations with low teacher self-efficacy will be more common among novice teachers (Webster et al., 2012).

According to the National Report of Kazakhstan (IAC, 2019), based on TALIS 2018 data, it provides essential information of Kazakhstani teachers and principal characteristics. Middle age in Kazakhstan is equal to 41 years (OECD average 44). More than half (55%) of the

pedagogical staff of Kazakhstan are teachers from 30 to 49 years old. The smallest share of teachers (18%) is under 30 (OECD average 11%). Almost a third (27%) of Kazakhstani teachers are over 50 years old (OECD average 34%). The Kazakhstani education system needs to update at least a third of the teaching staff in the next ten years. Middle age Kazakhstan principals are 48 years old (OECD average 52). The largest share of principals (77%) falls on the age from 40 to 59 years. Almost 1/5 of the principal's corps (18%) - are people under the age of 40, fewer principals over 60 (5%) than in OECD countries (20%).

The share of female teachers in Kazakhstan is 76%, which exceeds the average for OECD countries by 8% (68%). The proportion of Kazakhstani female teachers is higher in urban areas than in rural areas: 83% and 71%, respectively. At the same time, there are fewer female representatives among school principals than among teachers (principals - 53%, teachers - 76%). In addition, Kazakhstan is one of the countries with the lowest proportion of teachers with postgraduate education. Most Kazakhstani teachers (89.4%) have bachelor's degrees (OECD - 49.3%), whereas the proportion of teachers with a master's degree is 3.5% (OECD - 44.2%), PhD - 0.1% (OECD - 1.3%).

## **2.7 Conclusion**

The major aspects of teachers' instructional and innovative practices have been discussed in this chapter. Teaching practice, alongside classroom management, has been proven to explain levels of instructional effectiveness in the classroom. It suggests that self-efficacy is necessary for teachers to stay in the field, and teachers should have a solid pedagogical foundation before entering the classroom. This indicates that motivation and classroom management skills are all predicted by self-efficacy.

Furthermore, a positive and significant relationship was discovered between school principals' innovative abilities and the level of innovation in their schools. The researchers discovered that organizational learning is a better predictor than innovation culture when it

comes to product innovation culture surpassing organizational learning in the innovation process. Also, a teacher's level of academic qualification exhibited a statistically significant relationship with innovation.

Regarding teacher background factors, female gender and more extensive teaching experience are likely to indicate higher teacher performance. However, male teachers appear to have stronger convictions about their abilities to manage student behaviour. In Kazakhstan, the average age of a teacher is 41 years old, and 76 % of the population are female teachers—therefore, research in the general area should account for teacher gender. The empirical research findings on the impact of Instruction practices on Innovation practices will be explored and presented in the following chapter.

## **Chapter 3. Methodology**

### **3.1 Introduction**

This section will cover research design and methods adopted in the current investigation. As described, the inquiry will address four main research questions as described in section 1.3 of this manuscript.

### **3.2 Research Design**

Based on the TALIS 2018 data, a quantitative approach was chosen for this study to examine Kazakhstani teachers' instructional practice and innovation. According to Bell (2005), "the approach adopted and the methods of data collection selected will depend on the nature of the inquiry and the type of information required" (p. 8). Moreover, Creswell (2012) maintains that:

In quantitative research, the investigator identifies a research problem based on trends in the field or on the need to explain why something occurs. Describing a trend means that the research problem can be answered best by a study in which the researcher seeks to establish the overall tendency of responses from individuals and to note how this tendency varies among people (p. 12).

It is also important to note that a cross-sectional survey design was used for TALIS 2018. Creswell (2012) explains,

In a cross-sectional survey design, the researcher collects data at one point in time. This design has the advantage of measuring current attitudes or practices. It also provides information in a short amount of time, such as the time required for administering the survey and collecting the information (p. 377).

Therefore, this study follows a cross-sectional survey design and makes use of quantitative methods to explore relationships in the data. This study can also be considered a correlational study because relationships between variables are of key concern.

### **3.3 Participants**

All Kazakhstani applicants from TALIS 2018 will be chosen for secondary data analysis. A total 6,566 lower secondary teachers and 331 principals (representing 33 schools) completed the TALIS questionnaires in Kazakhstan from 16 regions (OECD, 2019a). Multiple variables were included in this study. For example, schools were classified in the following ways: school type (NIS, Kazakh-Turkish Lyceum, Trilingual Daryn school, Private school, Republican physics-mathematical school, School taking part in per capita financing experiment and public schools), rurality (urban, rural), and language of instruction (Kazakh, Russian, and mixed). Important to note is that the,

The Teaching and Learning International Survey (TALIS) was developed in the OECD Indicators of Education Systems (INES) project. TALIS is an ongoing large-scale survey program of teachers, school leaders and school learning environments designed to address policy-relevant issues chosen by the participating countries/economies (OECD, 2019b, p. 35).

Because the TALIS surveys are ongoing, follow up studies can also be carried out using the same research design for different TALIS survey cycles.

### **3.4 Sampling Approach Used for the TALIS Survey**

In the TALIS survey, the sampling frame was first established by way of the following information: the national school identifier, the size indicator, school type (public or private), and stream (academic or professional; though relevant for other countries). For Kazakhstan,

the stratification resulted in detail concerning geography, source of funding, type of educational program, and school size for each school in the country. The teacher data was obtained using a two-stage sampling design, selecting a sample of schools, and then selecting a sample of teachers from each selected school. Systematic sampling, with school selection in the first stage proportional to school size, was used for the sampling method. In addition, thirty schools from Kazakhstan took part in the field trials. In addition, thirty schools from Kazakhstan took part in the field trials. For the second stage, the selection of 20 teachers in the selected school was based on a random sample. A modified stratification with overlap control was used to select schools (333 schools) for the current survey to minimize the probability of selecting schools that had already participated in field trials (OECD, 2019b).

### **3.4.1 Data Extraction and Preparation**

The open-source R statistical software was utilized to prepare and analyze TALIS 2018 data for this study (Appendix A). The SPSS files of survey TALIS 2018 results in .sav format were read into R (R Core Team, 2019) with the haven package (Wickham & Miller, 2020). There were 6,566 teachers from 331 schools in Kazakhstan, with 448 variables for principals and 493 variables for teachers. "IDSCHOOL" with the standard prefix number of "398" for Kazakhstan retrieved and merged survey participants' data. The data were successfully integrated with 6,566 teachers and a total of 940 variables after reading both the teacher and principal files. Only the 78 variables of interest relating to teachers' instructional practices and innovation were chosen for the current analysis. The semantic direction of each question was analyzed (and, ultimately, reverse coded as appropriate) so as to logically explore the patterns in the data. While the initial number of teachers in Kazakhstan was 6,556, missing data for variables of interest meant that this was reduced to 5,634 final participating teachers. Missing data analysis was performed with the assistance of the tidyr package (Wickham & Lionel, 2020).

### **3.5 Instrumentation**

The following indicators (scales) will be used for the secondary data analysis, taken from the Conceptual Framework (OECD, 2018). The scales (Figure 2) cover the two main pedagogical and professional practices and include the following subscales: teachers' instructional practices, innovation, teacher education and initial preparation, teacher self-efficacy, human resource issues, and stakeholder relations. Teachers' instructional and professional practices are related to effective the policy area of effective teaching. Moreover, teacher education and initial preparation, teacher feedback and development, and teacher self-efficacy correspond to developing teacher attributes (for developing teachers).

#### **3.5.1 Independent, Control, and Dependent Variables**

The following measurement scales were selected from the TALIS 2018 questionnaire for teachers and principals to examine teachers' instructional practices and innovation. Teachers' instructional practices consist of scales such as clarity of instruction, cognitive activation, self-efficacy in classroom management, instruction, and student engagement. Needs for professional development in subject matter and pedagogy scale is also included. Furthermore, instruments pertaining to innovation cover team and organizational innovativeness. Moreover, school location (urban-rural) and region, teacher gender and age, school type, school language status, level of formal education will be chosen as independent control variables from TALIS 2018.

**Figure 2****Classification of Items Related to Pedagogical and Professional Practices**

Focus	Item in TALIS	TALIS code	
Teaching and learning (Pedagogical practices)	Teacher's Instructional practices (within-school)	Clarity of instruction (w)	T3CLAIN
		Classroom management	T3CLASM
		Cognitive activation (w)	T3COGAC
		Teaching practices, overall.	T3TPRA
		Teachers' perceived disciplinary climate	T3DISC
		Satisfaction with target class autonomy	T3SATAT
		Student behaviour stress	T3STBEH
	Innovation (within-school)	Organisational innovativeness	T3PORGIN
		Team innovativeness	T3TEAM
	Teaching profession (Professional practices)	Human resource issues and stakeholder relations	The Teacher identifier (w)
Teacher gender (w)			TT3G01
Teacher age (w)			TCHAGEGR
Languages (Russian, Kazakh) (b)			IDLANG
School type (b)			TC3G12
School location (b)			TC3G10
Principal age groups (b)			PRAGEGR
School identifier (b)			IDSCHOOL
Teacher education and initial preparation		Highest level of formal education of Teachers (w)	TT3G03
		Need professional development in subject matter and pedagogy (w)	T3PDPED
		Years of work experience as a teacher in total (w)	TT3G11B
		Highest level of formal education of Principal (b)	TC3G03
Teacher self-efficacy		Teacher self-efficacy, overall (w)	T3SELF
		Self-efficacy in classroom management (w)	T3SECLS
		Self-efficacy in student engagement (w)	T3SEENG
		Self-efficacy in instruction (w)	T3SEINS

*Note.* w = within school variable, b = between school variable.

The independent variables used in the study are included in Table 2.

**Table 2**  
*Independent Variables in the Current Study (Teacher-Level)*

Item	Code	<i>M</i>	<i>SD</i>	Skew	ICC
<b>Self-Efficacy in Classroom Management</b>					
Control disruptive behaviour in the classroom	TT3G34D	2.98	0.71	-0.27	0.02
Make my expectations about student behaviour clear	TT3G34F	3.10	0.69	-0.29	0.03
Get students to follow classroom rules	TT3G34H	3.25	0.66	-0.43	0.04
Calm a student who is disruptive or noisy	TT3G34I	3.14	0.70	-0.41	0.03
<b>Self-efficacy in Instruction</b>					
Craft good questions for students	TT3G34C	3.29	0.64	-0.41	0.05
Use a variety of assessment strategies	TT3G34J	3.24	0.68	-0.44	0.07
Provide an alternative explanation, for example when students are confused	TT3G34K	3.25	0.65	-0.40	0.03
Vary instructional strategies in my classroom	TT3G34L	3.14	0.65	-0.29	0.03
<b>Self-efficacy in Student Engagement</b>					
Get students to believe they can do well in school work	TT3G34A	2.91	0.72	-0.32	0.03
Help students value learning	TT3G34B	3.16	0.69	-0.27	0.10
Motivate students who show low interest in school work	TT3G34E	3.08	0.72	-0.24	
Help students think critically	TT3G34G	3.18	0.69	-0.35	0.09
<b>Clarity of Instruction</b>					
I present a summary of recently learned content	TT3G42A	3.07	0.82	-0.49	0.06
I set goals at the beginning of instruction	TT3G42B	3.54	0.68	-1.38	0.05
I explain what I expect the students to learn	TT3G42C	3.50	0.66	-1.12	0.02
I explain how new and old topics are related	TT3G42D	3.45	0.68	-0.95	0.03
<b>Cognitive Activation</b>					
I present tasks for which there is no obvious solution	TT3G42E	2.68	0.92	-0.19	0.08
I give tasks that require students to think critically	TT3G42F	3.03	0.73	-0.34	0.05
I have students work in small groups to come up with a joint solution to a problem or task	TT3G42G	3.01	0.72	-0.27	0.08
I ask students to decide on their own procedures for solving complex tasks	TT3G42H	2.95	0.72	-0.28	0.03
<b>Needs for Professional Development in Subject Matter and Pedagogy</b>					
Knowledge and understanding of my subject field(s)	TT3G27A	2.59	1.01	-0.32	0.17
Pedagogical competencies in teaching my subject field(s)	TT3G27B	2.64	0.98	-0.37	0.16
Knowledge of the curriculum	TT3G27C	2.57	1.07	-0.22	0.22
Student assessment practices	TT3G27D	2.77	0.99	-0.47	0.15
Student behaviour and classroom management	TT3G27F	2.52	1.04	-0.17	0.14

*Note.* <sup>1</sup>Response options range between 1 = not at all, 2 = to some extent, 3 = quite a bit, 4 = a lot; <sup>2</sup>Response options ranged between 1 = never or almost never, 2 = occasionally, 3 = frequently, 4 = always.

The control variables in the study (demographic variables) are included in Table 3.

**Table 3**  
*Control Variables in the Current Study (Teacher-Level)*

Item	Code	<i>M</i>	<i>SD</i>	Skew	ICC
<b>Demographic Variables</b>					
Teacher gender	TT3G01	1.23	0.42	1.28	0.04
Teacher age group (under 25 = 1, 25 to 29 = 2, 30 to 39 = 3, 40 to 49 = 4, etc.)	TCHAGEGR	3.6	1.3	-0.2	0.08
Years of work experience as a teacher in total	TT3G11B	16.25	11.63	0.41	0.07

The school principal variables are reported in Table 4.

**Table 4**  
*School Principal Variables in the Current Study (School Level)*

Item	Code	<i>M</i>	<i>SD</i>	Skew
<b>Principal Variables</b>				
School identifier	IDSCHOOL	3167.95	94.98	-0.02
Highest level of formal education of Teachers	TT3G03	5.00	0.49	-2.05
Highest level of formal education of Principal	TC3G03	5.80	5.82	1.71
The Teacher identifier	IDTEACH	316806.33	9497.66	-0.02
School type	TC3G12			
School location	TC3G10	2.7	1.5	0.1
Principal age groups	PRAGEGR	2.4	0.8	-0.1
Languages (Russian = X, Kazakh = X)	IDLANG	58.45	6.98	0.16
<b>Principal-Reported Organizational Innovativeness</b>				
This school quickly identifies the need to do things differently	TC3G28A	3.09	0.53	-0.02
This school quickly responds to changes when needed	TC3G28B	3.24	0.47	0.67
This school readily accepts new ideas	TC3G28C	3.27	0.55	0.05
This school makes assistance readily available for the development of new ideas	TC3G28D	3.29	0.53	0.01

*Note.* <sup>1</sup>Response options range between 1 = Rural (up to 3,000 people), 2 = Town (3,001 to 100,000 people), 3 = City (more than 100,000 people); <sup>2</sup>Response options range between 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree.

The dependent variables included in the current study include those pertaining to innovation and classroom practices. Table 5 provides a description of the specific dependent variables included the current study.

**Table 5**  
*The Dependent Variable Adopted in the Current Study: Team Innovativeness*

Item	Code	<i>M</i>	<i>SD</i>	<i>Skew</i>	<i>ICC</i>
Teacher-Level Variables (level 1)					
Most teachers in this school strive to develop new ideas for teaching and learning.	TT3G32A	3.14	0.61	-0.43	0.04
Most teachers in this school are open to change.	TT3G32B	3.05	0.62	-0.33	0.04
Most teachers in this school search for new ways to solve problems.	TT3G32C	3.15	0.61	-0.32	0.04
Most teachers in this school provide practical support to each other for the application of new ideas.	TT3G32D	3.21	0.61	-0.36	0.06

*Note.* <sup>1</sup>Response options range between 1 = strongly disagree, 2 = disagree, 3 = agree, 4= strongly agree.

### 3.6 Data Analysis

In the current study, the TALIS 2018 dataset regarding teachers' pedagogical and innovative practices was analyzed using the open-source R software and related packages (R Core Team, 2020).

For RQ1, analysis involved confirmatory factor analysis (CFA) to determine the best measurement model for the teachers' preparation in classroom management and instructional practice. Analysis was performed with the assistance of lavaan (Rosseel, 2012) and semTools packages. Convergent and discriminant validity was determined by way of minimum item-factor loadings of .50 (Fornell & Larcker, 1981).

For RQ2, analysis involved the use of multi-level modelling to determine how the outcomes of interest vary within- and between schools. Specifically, the analysis involved the use of the misty package and multi-level.icc function (Yanagida, 2020). If the ICC values for the variables of interest are greater than 0.10, then multilevel modeling will be chosen as the most appropriate method.

For RQ3(a), the analysis will involve the specification of a structural model to determine the effects of teacher preparation in classroom management on innovative instructional

practice. Analysis for RQ3 will be carried out with the tools of the R lavaan package's sem function (Rosseel, 2012).

For RQ3 b), the same approach is use as in RQ3(a) however the model will be more parsimonious controlling for teacher gender and age.

### **3.7 Ethical Considerations**

Because the study uses secondary data analysis from the online TALIS system database, ethical issues are not required because the participants were not directly participated in it. “The manner in which data were collected during TALIS 2018 ensured the anonymity of teachers and principals in the reporting of results. It also ensured that any information encountered that may have identified the teachers or principals participating in the survey remained confidential” (OECD (b), 2019, p. 131). Significantly, Cohen et al. (2007) state that “all investigators, from undergraduates pursuing a course-based research project to professional researchers striving at the frontiers of knowledge, must take cognizance of the ethical codes and regulations governing their practice” (p. 71).

## Chapter 4. Results

### 4.1 Introduction

This chapter systematically describes the current results. This study used the TALIS 2018 dataset and aimed to identify the factors influencing teachers' instructional practices and innovation in Kazakhstan. This chapter presents the findings of the analysis with the results for each research question presented separately.

### 4.2 RQ1: Measurement Model for Classroom Management and Instructional Practice in Kazakhstan

Based on the confirmatory factor analysis, we identified a good-fitting measurement model as relevant to the Kazakhstani context (Figure 3). The figure provides all inter-factor correlations and item-factor loadings. The model includes seven factors: self-efficacy in classroom management, instruction, and student engagement; clarity of instruction, cognitive activation, needs for professional development in subject matter, and team innovation. One item pertaining to student engagement, namely, TT3G34A (get a student to believe they can do well) and one item pertaining to clarity of instruction, namely, TT3G42A (present a summary of recently learnt content) were removed due to low item-factor loadings under .50 and poor model fit. Nevertheless, the item-factor loadings for Student Engagement (TT3G34A) and Clarity of Instruction (TT3G42A) were also below .50, specifically .45 and 0.40, respectively. However, as these were theoretically aligned, they were retained. Overall, the correlation between factors was statistically significant in all instances. Moreover, the level of statistical significance for all inter-factor correlations were  $p < .001$ . Finally, all the item-factor loadings were statistically significant ( $p < .001$ ) and within in the accepted .4 to 1.0 range.

The correlation between factors were generally positive and substantive. However, the correlation between SE: Classroom management and Needs for Professional Development was  $r = .06$ , considered negligible. Finally, the correlation between Clarity and Needs for Professional Development was negative at  $r = -.06$ .

Regarding the fit indices in Table X,  $\chi^2/df$  ratio = 12.06, which was statistically significant with  $p < .001$  (though sensitive to large samples). The CFI and TLI indices were acceptable at over .90, indicating a acceptable (CFI = .95, TLI = .94). Additionally, the RMSEA value of .05 also suggest that the model was a good fit to the data. All model fit indices for the measurement model are presented in Table 6.

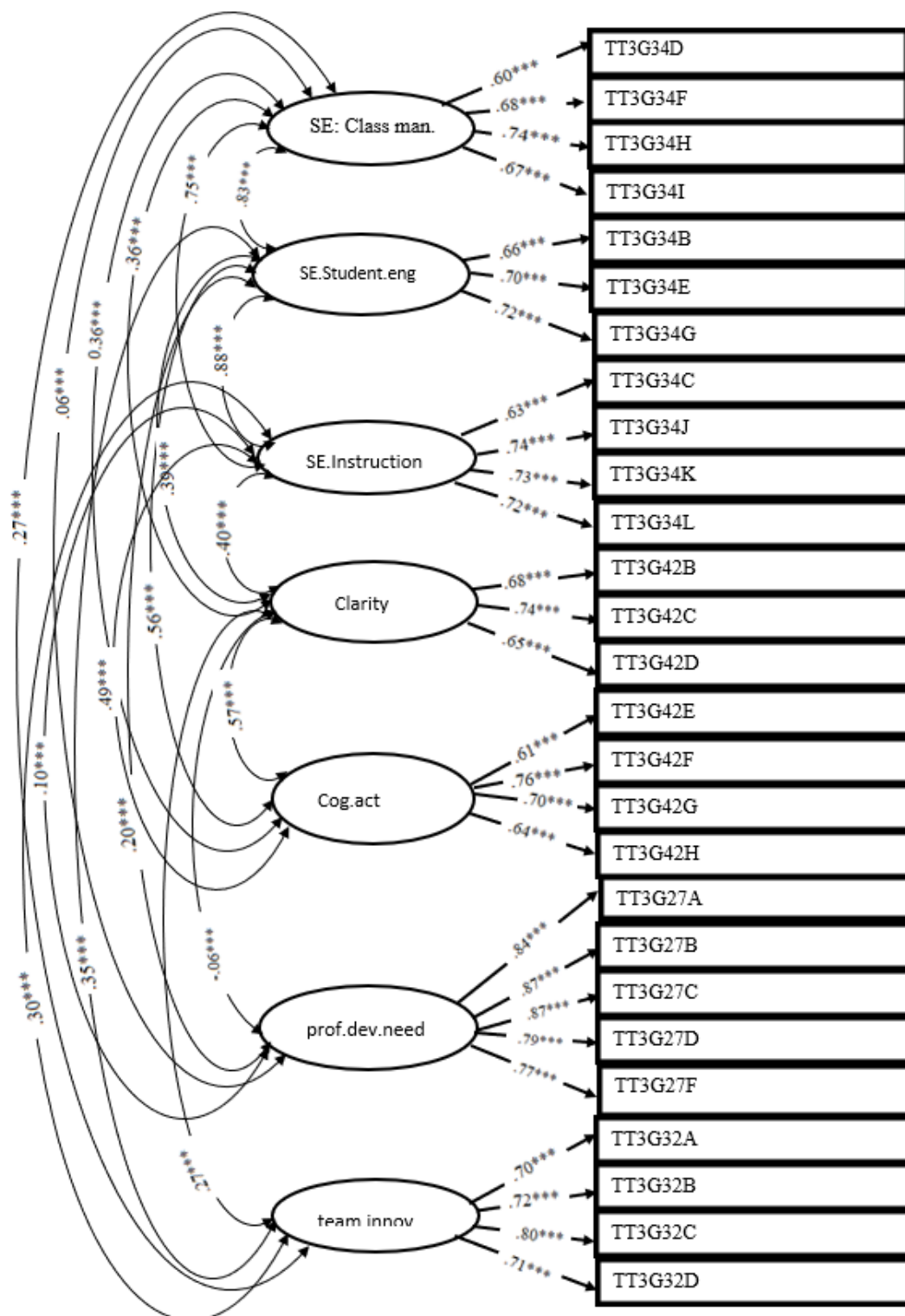
**Table 6**  
*Model Fit Indices for Measurement*

Model	<i>N</i>	$X^2$	<i>df</i>	$X^2/df$	<i>p</i>	<i>CFI</i>	<i>TLI</i>	<i>SRMR</i>	<i>RMSEA</i>
CFA & SEM	5634	3654.893	303	12.06	.001	.95	.94	.033	.044 (L=.04, U=.05)

*Note.* *N* = number of observations;  $X^2$  = Chi-squared; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis Index; SRMR = Standardized Root Mean Square Residual; RMSEA = root mean square error of approximation; U = upper 90% confidence interval; L=lower 90% confidence interval.

Figure 3

Teacher's Instructional Practices and Innovation in Kazakhstan Measurement Model



2

Note. <sup>ns</sup> $p > .05$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

### **4.3 RQ2: Variance in Teachers' Preparation in Classroom Management and Instructional Practice Within- and Between Schools**

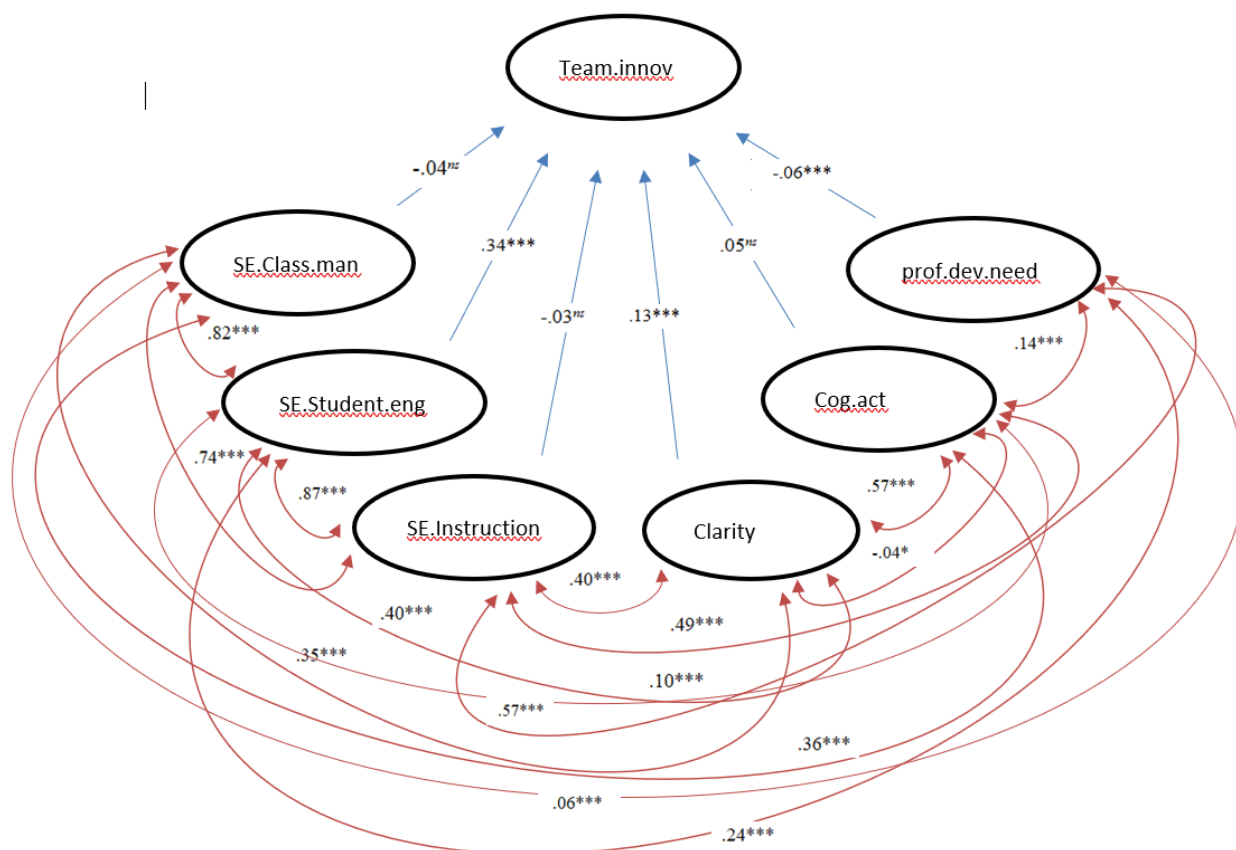
With reference to Tables 2 to 5, the ICCs were generally under .10. Therefore, multi-level modelling was deemed not necessary for the final regression analyses. Table 2 provides the ICCs for the independent variables. It is noted that ICCs are between .02 and .10 for Self-Efficacy in Classroom Management, SE in Instruction, SE in Student Engagement, Clarity of Instruction, and Cognitive Activation. However, for the factor, Needs for Development, the ICCs were .14 and .22. Demographic variables also exhibited low ICCs between .04 and .08. Likewise, for the dependent variable in the study, item ICCs ranged between .04 and .06. As the vast majority of items exhibited low-levels of between-school differences, single-level analysis was chosen as a consequent form of analysis for the final research question of this study.

### **4.4 RQ3(a): The Role of Teacher Preparation in Classroom Management on Instructional Practice and Innovation in Kazakhstan**

In the equation structural model, all six teachers' instructional practice factors were modelled as independent variables, and the team innovativeness was modelled as dependent variables. Analysis suggested that three teachers' instructional practice factors, primarily, Self-efficacy in Student Engagement, Clarity of Instruction, Needs for Professional Development in Subject Matter and Pedagogy, were significant predictors for the main outcome of interest, Team Innovativeness. The other three factors, namely, Self-Efficacy in Classroom Management, Self-efficacy in Instruction, and Cognitive Activation, were insignificant for team innovativeness (Figure 4).

Figure 4

Structural Equation Model with the Predictors of Team Innovativeness



Note.  $^{ns}p > .05$ ,  $^*p < .05$ ,  $^{**}p < .01$ ,  $^{***}p < .001$ .

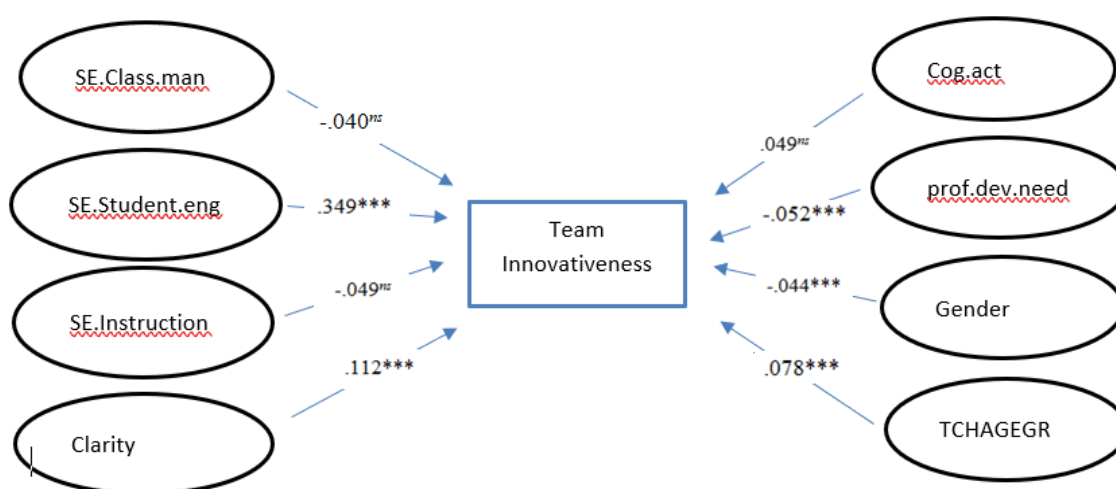
With regards to the results, Self-efficacy in Student Engagement and Clarity of Instruction had the most positive impact on team innovativeness with the following effects, ( $b = .335$ ,  $p < .000$ ) and ( $b = .132$ ,  $p < .000$ ), respectively. The second highest effect appeared to be Needs for Professional Development in Subject Matter and Pedagogy; nevertheless, this category had a statistically significant negative impact on Team Innovativeness ( $b = -.064$ ,  $p < .001$ ).

Moreover, Self-Efficacy in Classroom Management ( $b = -.040$ ,  $p > .05$ ), Self-efficacy in Instruction ( $b = -.036$ ,  $p > .05$ ), and Cognitive Activation ( $b = 0.048$ ,  $p > .05$ ) was not a statistically significant predictor for team innovativeness.

To conclude, it was identified that (1) Self-efficacy in Student Engagement, and (2) Clarity of Instruction have the most substantive effect on team innovativeness in Kazakhstan.

**4.5 RQ3(b): Parsimonious structural model best represents the role of teacher preparation in classroom management on instructional practice and innovation in Kazakhstan**

In the parsimonious structural model, all six teachers' instructional practice factors were modelled as independent variables, and teacher gender and teacher age group as control variables, and the team innovativeness was modelled as the dependent variable. Analysis suggested that four teachers' instructional practice factors, primarily, (1) Self-efficacy in Student Engagement, (2) Clarity of Instruction, (3) Teacher age group (TCHAGEGR), and (4) Teacher gender (TT3G01) (being male) were positive and significant in relation to Team Innovativeness. However, Professional Development in Subject Matter and Pedagogy was also significant but with negative impacts. The other three factors such as Self-Efficacy in Classroom Management, Self-efficacy in Instruction, and Cognitive Activation, were statistically insignificant for team innovativeness (Figure 5).

**Figure 5***Structural Equation Model with the Predictors of Team Innovativeness (with Controls)*

*Note.* <sup>ns</sup> $p > .05$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

Regarding to the results, Self-efficacy in Student Engagement had the most positive impact on team innovativeness with the following effects, ( $b = .349$ ,  $p < .000$ ). The second highest effect appeared to be Clarity of Instruction and Teacher age group, ( $b = .112$ ,  $p < .000$ ) and ( $b = .078$ ,  $p < .000$ ), respectively. Particularly, Effect of Teacher age on innovation shift up in age range. Moreover, Teacher gender factors show that being male affects team innovation, ( $b = -.043$ ,  $p < .002$ ).

Moreover, Self-Efficacy in Classroom Management ( $b = -.040$ ,  $p > .05$ ), Self-efficacy in Instruction ( $b = -.049$ ,  $p > .05$ ), and Cognitive Activation ( $b = .049$ ,  $p > .05$ ) were not a significant predictor for team innovativeness.

To conclude, it was identified that (1) Self-efficacy in Student Engagement, (2) Clarity of Instruction, (3) Teacher age group, and (4) Teacher gender (being male) have the most substantive effect on Kazakhstani team innovativeness.

#### **4.6 Conclusion**

In this chapter, the study's key findings are presented. A study on teachers' instructional practices and innovation using descriptive statistics, confirmatory factor analysis, single-level analysis, structural equation modelling, and parsimonious controlling procedures was presented for 6,566 school teachers and 331 principals in Kazakhstan from the TALIS 2018 survey database. Overall, the correlation between the chosen factors was generally positive and substantive. However, the link between Self-efficacy in Classroom Management and Needs for Professional Development was deemed insignificant. Also, there was a negative association between Clarity of Instruction and the Needs for Professional Development. Self-efficacy in Student Engagement, Clarity of Instruction, and Needs for Professional Development in Subject Matter and Pedagogy were significant predictors of Team Innovativeness among other teachers' instructional practice characteristics. Self-efficacy in Student Engagement, Clarity of Instruction factors and Teacher age group, were essential factors of Team Innovativeness. The following chapter discusses the research findings with the literature review conducted.

## **Chapter 5. Discussion**

### **5.1 Introduction**

This chapter delves deeper into the findings of the current study aimed at identifying the determinants of teachers' instructional approaches and innovation in Kazakhstan. This chapter is divided into four main sections in line with the four research questions. The findings for the measurement model for classroom management and instructional practice is discussed in the first section. The second section discusses the relevance of the result that teachers' preparation for classroom management and instructional practice largely differs within schools, as opposed to between schools. The influence of teacher preparation in classroom management on instructional practice and innovation is discussed in the third section. Finally, in the fourth section, the results for the parsimonious structural model, which also controls for teacher demographic factors, will also be discussed. Finally, the chapter is summarized with a summary of the critical points.

### **5.2 RQ1: Measurement Model for Classroom Management and Instructional Practice in Kazakhstan**

A seven-factor measurement model for classroom management and instructional practice aspects was developed to reflect the observed data: self-efficacy in classroom management, instruction, and student engagement; clarity of instruction, cognitive activation, needs for professional development in subject matter, and team innovation. Construct validity was supported by the measurement model, which was well-fitting. This suggests that the suite of constructs included in the study design appear to be measured usefully in the Kazakhstani milieu. In line with theory, most of the factors were positively and statistically significantly correlated. However, the link between classroom management self-efficacy and professional development needs was deemed insignificant—this was slightly unexpected as one would assume a negative correlation in this instance with poor classroom management associated

with a need for professional development. However, there was a negative relationship between clarity and the need for professional development.

The present findings seem to be consistent with other research which found that teacher self-efficacy significantly impacts teachers' instructional practices. For example, based on a sample of 342 German pre-service teachers, Depaepe and König (2018) examined the relationship between their professional knowledge, instructional efficacy, and teaching practice. In that study two cognitive activation sub-dimensions appeared to be closely related to the use of cognitive tasks with higher requirements and motivate students' cognitive independence. In the same study, two classroom management sub-dimensions was associated with the avoidance of misunderstandings in the classroom and the provision of lesson structure. Finally, two student support sub-dimensions was found to be positively associated with teachers' level of encouragement of students and teachers' ability to cope with student heterogeneity. Therefore, the current study helps to confirm the general positive relationship between the suite of factors associated with teacher self-efficacy, student cognitive activation, and engagement in the Kazakhstani educational context.

Furthermore, the current results cohere with the findings of Robin Jung Cheng et al. (2020) in which Clarity of instruction practice was strongly associated with classroom management efficacy. In that study, classroom management efficacy ( $b = -.199, p < .001$ ) and Instruction efficacy were both associated with classroom management practice.

This combination of findings for the measurement of the constructs in the current study provides support for the idea that classroom management, instructional efficiency, and cognitive activation are distinct but strongly associated phenomena in Kazakhstan.

### **5.3 RQ2: Variance in Teachers' Preparation in Classroom Management and Instructional Practice Within- and Between Schools**

The current study found that the ICCs for almost all the factors were less than .10. Because most items had minimal levels of between-school differences, single-level analysis was chosen as the analysis method for the study's final research questions.

This finding also concurs with earlier research focused on another aspect of TALIS 2018 in Kazakhstan, teacher safety in schools. The evidence from this study suggests that intra-class correlations were less than .10, implying that between-school effects accounted for less than 10% of the variance in those outcomes (Dosmurzina, 2021). It seems that the TALIS 2018 results within- and between Schools in Kazakhstan share a similar level of intra-class correlation. Therefore, it can be assumed that there are not many systematic differences among Kazakhstani schools in terms of teacher self-efficacy, student cognitive activation, and innovativeness.

Only the ICCs for the Needs for Professional Development component, on the other hand, were .14 and .22. This may reflect some level of systemic differences and unequal access to training in subject matter and pedagogy in the country. According to National Report on the results TALIS 2018 (IAC, 2019), Kazakhstani teachers experience a "high degree of need" for teaching courses on the content of updated curricula and textbooks (37%), criteria-based assessment (31%), and the use of ICT in teaching (30%). Therefore, systemic differences in access should be addressed in this regard. In that report, we note the specific breakdown in the needs for professional development:

Regarding responses, school management and leadership are areas of high demand for only 11% of teachers, interaction with learners with different cultural backgrounds, 12%, teaching in a multilingual/multicultural environment, 13%, and teaching students with special

needs, 14%. Taken together, it should be assured that training in these areas is more equitably distributed and offered to schools in Kazakhstan.

To conclude, there are few differences between Kazakhstani schools and teachers regarding pedagogical practices; however, there appears to be some unequal access that teachers' need support in professional development that should be carefully accounted for.

#### **5.4 RQ3(a): The Role of Teacher Preparation in Classroom Management on Instructional Practice and Innovation in Kazakhstan**

While relationship between self-efficacy and innovation has been explored in studies of organizational behavior, there exists a dearth of literature focused on the relationship between Teachers' Instructional practices and Team Innovation in educational research. Therefore, the current study sheds new light in this area. The most intriguing discovery was that three instructional practice variables of teaching, namely, Self-efficacy in Student Engagement, Clarity of Instruction, and Need for Professional Development in Subject Matter and Pedagogy, were significant predictors of Team Innovativeness. However, the other three criteria such as Self-Efficacy in Classroom Management, Self-efficacy in Instruction, and Cognitive Activation, had less impact on team innovation.

These results are consistent with those of other studies and suggest that creative self-efficacy is strongly influenced employee innovation (Hu, & Zhao, 2016). Moreover, the findings of the current study appear linked to findings in other studies in which respondents believe that peer learning and professional development factors impact self-efficacy perception, active teaching methods, and job satisfaction (Oddone, 2016). According to the OECD (2019c), innovation refers to school environments that are receptive to new ideas. Most teachers in the school provide practical support to one other in applying new ideas, according to 78% of teachers. This organizational component, innovation, appears to be more important in Georgia, Kazakhstan, Shanghai (China), and Vietnam (over 90% of teachers

mentioned it), but less so in Belgium and Portugal (less than 70% of teachers reported).

Therefore, some comparative studies may be of use in the future in order to understand teacher innovation.

To sum up, Self-efficacy in Student Engagement, Clarity of Instruction, and Professional Development in Subject Matter and Pedagogy can predict Team Innovation, and Kazakhstani teachers are open to innovative ideas as a school team. Therefore, it is posited here that further enhancement in teacher innovative practices may rest on enhancing teacher self-efficacy, clarity of instruction, and providing equal opportunities for teachers to tailored professional development courses.

### **5.5 RQ3(b): Parsimonious Structural Model**

As mentioned in the previous section, the analysis revealed that three teachers' instructional practice characteristics, notably Self-Efficacy in Student Engagement, Clarity of Instruction, and Professional Development in Subject Matter and Pedagogy, were significant concerning Team Innovativeness in the parsimonious structural model. However, this subsection discusses the supplementary findings of the current study pertaining to the role of demographic factors. Moreover, findings from the current study suggest that teacher age group (being older) and Teacher gender (being male) also positively contribute to Team Innovation. Therefore, this study extends the scholarship of the effect of teachers' background characteristics on teaching and learning.

The findings observed in this study mirror those of the previous studies discussed in the literature review. For instance, male primary school teachers over the age of 44, with more than 16 years of teaching experience, appear to have more confidence in handling student behaviour. Those male teachers can deal with high-pressure situations, assist their students

better in achieving their academic goals, and ensure that their students learn from teaching materials (Aikaterini, & Belias, 2016).

However, contrary to this, other studies revealed that the being female was associated with higher levels of teaching performance (Lin, Gorrel & Taylor, 2002; Mertler, 2004). For instance, more than half of Kazakhstan's pedagogical staff (55%) are teachers aged between 30 and 49 (IAC, 2019) and majority of them are female teachers. As discussed in the literature review part, Kazakhstan has a female teacher share of 76%, which is 8% higher than the OECD average (68%). Moreover, the proportion of female teachers in urban areas is higher than in rural area: 83% and 71%, respectively (IAC, 2019). This finding indicates gender imbalance in Kazakhstani schools. According to Beilock et al. (2010) and Dee (2005), in some subjects and situations, the gender balance of the teaching staff has been demonstrated to impact students' attitudes, career goals, and achievements via role model effects. Given the positive contributions that males appear to make to team innovativeness, policy that promotes more proportional distribution of male teachers may be useful in Kazakhstan.

Conversely, in terms of age, other researchers (see Tumova, 2012; Webster et al., 2012) have highlighted that long-serving teachers may not retain an optimistic professional outlook, because, as they mature, they face difficulties coping with the demands of teaching and changing individual situations often needing to change due to the added responsibility of managing. Therefore, the effects of age may differ depending upon the various situations and contexts in different countries.

In summary, the results in the current study suggest an effect of being male more mature and on team innovation. More in-depth analysis of these affects are worthy of further investigation.

## 5.6 Summary

The findings for the four questions in the current study have been discussed in this chapter. The findings pertaining to the measurement model support the conclusion that there are strong relationships between classroom management and instructional practice and confirm these associations for the Kazakhstani context. Similar to other TALIS 2018 studies in Kazakhstan, there are few systematic differences in teachers' preparation in classroom management and instructional practice between schools, though opportunities for professional development appear somewhat dependent upon schools so equal access to training opportunities should be provided. Moreover, team innovation can be predicted by self-efficacy in student engagement, clarity of instruction, and professional development in subject matter and pedagogy and this finding both mirrors and extends studies in organizational behavior. Finally, findings on the effect of teachers' background characteristics suggest that being male and more mature may be associated with improved level of team innovativeness possibly highlighting the importance of more representative gender balances in schools.

## Chapter 6. Conclusion

### 6.1 Summary of Research Findings

Teachers' instructional practices can impact school outcomes, while team innovation result in improved teaching. Using the TALIS 2018 data, this study explores the role of teachers' instructional techniques such as classroom management, clarity of instruction, cognitive activation, self-efficacy in teaching and professional development on innovation in Kazakhstani schools.

The independent variables of interest were teachers' instructional practice aspects, while the control variables were teacher gender and age group, and the dependent variable was team innovativeness. The research analysis involved confirmatory factor analysis (CFA) to determine the best measurement model for the teachers' preparation in classroom management and instructional practice. Single-level modelling was used to explore the outcomes of interest as there was little variation between schools. Finally, two good-fitting structural models were proposed to look at the effect of teacher preparation in instructional practice on team innovation.

The current study investigates the strong relationships between classroom management and instructional practice factors. Specifically, findings suggest that teachers' instructional practice factors such as Self-efficacy in Student Engagement, Clarity of Instruction, Needs for Professional Development in Subject Matter and Pedagogy are significant predictors of Team Innovativeness. Furthermore, the Teacher's age group (maturity) and gender (male) have the greatest impact on Kazakhstani team innovativeness. It was suggested that supporting gender balance in schools Kazakhstan might significantly improve the level of team innovativeness and, consequently, student learning.

One notable finding was the elevated levels of school differences in the need for professional development. This is important given the National Report on the results of TALIS 2018 (IAC, 2019), where it was found that Kazakhstani teachers require in-service support for the content of curriculum and textbooks, criteria-based assessment, and the use of ICT in teaching. Therefore, findings herein suggest that such training should be offered on a fairer and more equitable basis. It is speculated that teachers' fulfillment in these specific areas of need might support the more efficient delivery of the new programs and curricula material.

## **6.2 Limitations and Recommendations**

Findings from the current study suggest that classroom management, instructional efficiency, and cognitive activation practice in Kazakhstan are both distinct and highly connected phenomena. In terms of educational practices, there are few distinctions between Kazakhstani schools, nonetheless there *appears* to be some unequal access to professional development for teachers, which should be carefully considered. The main finding of this study was that Team Innovation can be predicted by self-efficacy in student engagement, clarity of instruction, and professional development in subject matter and pedagogy, and that, positively, Kazakhstani teachers appear to be open to new ideas as a school team. As a result, it is proposed that improving teacher self-efficacy, clarity of instruction, and giving equal opportunity for teachers to customize professional development courses could lead to additional improvements in innovative teaching practices. Furthermore, the findings of this study imply that being male and older has an impact on team innovation. More in-depth investigations of these consequences are warranted.

## **6.3 Recommendation for Future Research**

Data for this survey was taken from the TALIS teacher survey administered in 2018. Therefore, it is important that follow up studies are conducted on the next cycle of TALIS

data to ensure replicability. Further, follow up research might consider exploring: the effect of team innovativeness on student academic performance, the extent to which school status (public, rural/urban, etc.) might be associated with inequitable professional development needs, and the role of gender on team innovativeness in Kazakhstan.

### **6.3.1 Recommendation for Administration and Ministry of Education**

To achieve desired outcomes in education, teachers need continuous support in instructional and professional practices inside both pre-service to in-service organizations. Classroom management, teacher assistance, clarity of instruction, and cognitive activation are all examples of promising instructional practices, according to the OECD (2018). Therefore, (a) providing teachers with equitable opportunities to tailored professional development courses in many areas of classroom management and instructional methods will likely result in increased school innovation. Further, additional research into (b) planning and preparation, classroom conditions, and instruction can be investigated to better understand better how teacher efficacy might be understood and measured (Kunin, 1970). In addition, (c) evaluating teachers' needs and delivering systematic professional development programs will likely have an important impact on teaching practice and generate professional learning communities. Furthermore, in Kazakhstan, promoting a more balanced gender policy that encourages an equal distribution and contribution from male and teachers may positively impact innovation and learning outcomes. Future research is needed in this area to ensure that ongoing innovative practice occurs in Kazakhstani high schools in the future.

### References

- Agnew, R. (1993). Why do they do it? An examination of the intervening mechanisms between "social control" variables and delinquency. *Journal of Research in Crime and Delinquency*, 30, 245–266.  
<https://doi.org/10.1177/0022427893030003001>
- Andrews, P. (2007). Barriers to innovation. *Leadership Excellence*, 24(10).
- Autor, D. H., Levy, F., & Murnane, R. J. (2003). The skill content of recent technological change: An empirical exploration. *The Quarterly Journal of Economics*, 118, 1279–1333. <https://doi.org/10.1162/003355303322552801>
- Bandura, A. (1977). *Social learning theory*. Prentice, Englewood Cliffs.
- Baumert, J., & Kunter, M. (2006). Stichwort: Professionelle Kompetenz von Lehrkräften [Teachers' professional competence]. *Zeitschrift für Erziehungswissenschaft* 9(4), 469–520. doi:10.1007/s11618-006-0165-2
- Baumert, J. et al. (2010). Teachers' mathematical knowledge, cognitive activation in the classroom, and student progress. *American Educational Research Journal*, 47(1), 133-180. <http://dx.doi.org/10.3102/0002831209345157>
- Beilock, S. et al. (2010). Female teachers' math anxiety affects girls' math achievement. *Proceedings of the National Academy of Sciences of the United States of America (PNAS)*, 107(5), 1860-1863. <http://dx.doi.org/10.1073/pnas.0910967107>
- Bell, J. (2005). *Doing your research project. A guide for first-time researchers in education, health and social science* (4th ed.). Open University Press.

Black, P., & Wiliam, D. (1998). Assessment and Classroom Learning. *Assessment in Education: Principles, Policy & Practice*, 5(1), 7–74.

<https://doi.org/10.1080/0969595980050102>

Bolam, R., McMahon, A., Stoll, L., Thomas, S., Wallace, M., Greenwood, A., Hawkey, K., Ingram, M., Atkinson, A., & Smith, M. (2005). Creating and Sustaining Effective Professional Learning Communities. *DfES Research Report, 637*, 1-222. University of Bristol. <http://dera.ioe.ac.uk/5622/1/RR637.pdf>

Brookhart, S. M. (2011). Educational Assessment Knowledge and Skills for Teachers. *Educational Measurement: Issues and Practice*, 30 (1), 3-12.

<https://doi.org/10.1111/j.1745-3992.2010.00195.x>

Brophy, J. (1988). Research Linking Teacher Behavior to Student Achievement: Potential Implications for Instruction of Chapter 1 Students. *Educational Psychologist*, 23(3), 235–286. doi:10.1207/s15326985ep2303\_3

Brophy, J. (2011). History of research on classroom management [Ch. 2]. In C. M. Evertson & C.S.Weinstein (Eds.), *Handbook of classroom management: research, practice, and contemporary issues*. Routledge.

Brown, J.S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning, *Educational Researcher*, 18(1), 32-41. <https://doi.org/10.3102/0013189X018001032>

Bosworth, B. (1997). What is your classroom management profile? *Teacher talk-a publication for secondary education teachers*, 1(2). Retrieved from

<http://protectiveschools.org/drugstats/tt/v1i2/table.html>

- Cakir, R. (2021). Investigating the relationship between innovation competencies of school principals and innovation level of schools. *Educational Research and Reviews*, 16(4), 136-150. DOI: 10.5897/ERR2021.4130
- Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education* (6th ed.). Taylor & Francis e-Library.
- Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Pearson Education.
- Crossouard, B. (2011). Using formative assessment to support complex learning in conditions of social adversity. *Assessment in Education Principles Policy and Practice* *Policy & Practice*, 1, 59-72. <https://doi.org/10.1080/0969594X.2011.536034>
- Cyril, A. V., & Raj, M. A. (2017). Classroom management and metacognition of high school teachers. *I-manager's Journal on School Educational Technology*, 12(4), 24-34. Retrieved from <https://eric.ed.gov/?id=EJ1268905>
- Debbag, M., & Fidan, M. (2020). Relationships between prospective teachers' multicultural education attitudes and classroom management style. *International Journal of Progressive Education*, 16 (2). DOI:10.29329/ijpe.2020.241.8
- Dee, T. (2005). A teacher like me: Does race, ethnicity, or gender matter? *American Economic Review*, 95(2), 158-165. <http://dx.doi.org/10.1257/000282805774670446>
- Depaepe, F., & König, J. (2018). General pedagogical knowledge, self-efficacy and instructional practice: Disentangling their relationship in pre-service teacher education. *Teaching and Teacher Education*, 69, 177–190. <https://doi.org/10.1016/j.tate.2017.10.003>

Dosmurzina, D. (2021). *Understanding Teacher Safety in Schools in Kazakhstan* [Master's thesis, Nazarbayev University]. Nazarbayev University Repository

<https://nur.nu.edu.kz/>

Dignath, C., Buettner, G., & Langfeldt, H. (2008). How can primary school students learn self-regulated learning strategies most effectively? A meta-analysis on self regulation training programmes. *Educational Research Review*, 3, 101-129.

<https://doi.org/10.1016/j.edurev.2008.02.003>

Eisenman, G., Edwards, S., & Anne, C. (2015). Bringing reality to classroom management in teacher education. *The Professional Educator*, 39(1). Retrieved from

<https://eric.ed.gov/?id=EJ1062280>

Ericsson, K.A., Krampe, R.T., & Tesch-Römer, C. (1993). The Role of Deliberate Practice in the Acquisition of Expert Performance. *Psychological Review*, 100(3), 363-406.

Retrieved from <https://psycnet.apa.org/buy/1993-40718-001>

European Commission (2012). *Education and Training 2020 Work Programme*. Thematic Working Group' Assessment of Key Competences', Literature review, Glossary and examples.

Evertson, C. M., & Weinstein, C. S. (2011). *Handbook of classroom management: research, practice, and contemporary issues*. Routledge.

Feaster, J.G. (1968). Measurement and determinants of innovativeness among primitive agriculturists. *Rural Sociology*, 33, 339-348.

Fornell, C. G., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1).

<https://doi.org/10.1177/002224378101800104>

- Garret, T. (2014). *Effective classroom management. The essentials*. Teachers College Press
- Gettinger, M., & Kohler, K. M. (2011). Process outcome approaches to Classroom management and Effective Teaching [Ch. 4]. In C. M. Evertson & C.S.Weinstein (Eds.). *Handbook of classroom management: research, practice, and contemporary issues*. Routledge.
- Ghasemzadeh, P., Nazari, J. A., Farzaneh, M., & Mehralian, G. (2019). Moderating role of innovation culture in the relationship between organizational learning and innovation performance. *The Learning Organization*, 26(3), 289-303. doi:10.1108/tlo-08-2018-0139
- Glickman, C. D., & Tamashiro, R. T. (1980). Clarifying teachers' beliefs about discipline. *Educational Leadership*, 37(6), 459-464. Retrieved from [https://www.researchgate.net/profile/Roy-Tamashiro/publication/237308565\\_Clarifying\\_Teachers'\\_Beliefs\\_About\\_Discipline/links/5c3dfef792851c22a3770ec7/Clarifying-Teachers-Beliefs-About-Discipline.pdf](https://www.researchgate.net/profile/Roy-Tamashiro/publication/237308565_Clarifying_Teachers'_Beliefs_About_Discipline/links/5c3dfef792851c22a3770ec7/Clarifying-Teachers-Beliefs-About-Discipline.pdf)
- Greiff, S., et al. (2015). 21st century skills: International advancements and recent developments. *Thinking Skills and Creativity*, 1-3. <http://dx.doi.org/10.1016/j.tsc.2015.04.007>
- Griffin, P., Care, E., & McGaw, B. (2012). The changing role of education and schools. In P. Griffin, B. McGaw & E. Care (Eds.), *Assessment and teaching of 21st Century Skills* (pp. 1–15). Springer.
- Hattie, J. (2009). *Visible learning. Synthesis of over 800 meta-analyzes relating to achievement*. Routledge

Hill, H. C., Rowan, B., & Ball, D. L. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Educational Research Journal*, 42(2), 371–406. <https://doi.org/10.3102/00028312042002371>

Hirschi. (1969). *Causes of delinquency*. University of California Press.

Holzberger, D., Philipp, A., & Kunter, M. (2013). How teachers' self-efficacy is related to instructional quality: A longitudinal analysis. *Journal of Educational Psychology*, 105, 774–786. <https://doi.org/10.1037/a0032198>

Hu, B., & Zhao, Y. (2016). Creative Self-efficacy Mediates the Relationship Between Knowledge Sharing and Employee Innovation. *Social Behavior and Personality: An International Journal*, 44(5), 815–826. <https://doi.org/10.2224/sbp.2016.44.5.815>

Hurt, H.T., Joseph, K., & Cook, C. D. (1977). Scales for the measurement of innovativeness. *Human Communication Research*, 4(1), 58-65. <http://dx.doi.org/10.1111/j.1468-2958.1977.tb00597.x>

IAC (2019). *Natsionalnyi otchet Mezhdunarodnoe issledovanie prepodavaniia i obucheniiia TALIS-2018: pervye rezultaty Kazakhstana pervyi tom* [National Report International Teaching and Learning Survey TALIS-2018: First Results Kazakhstan Volume One]. Ministry of Education and Science: Information-Analytic Center. Retrieved from [https://iac.kz/wp-content/uploads/2022/01/naczionalnyj-otchet\\_talis-2018\\_rus.pdf](https://iac.kz/wp-content/uploads/2022/01/naczionalnyj-otchet_talis-2018_rus.pdf)

Illich, I. (1971). *Deschooling Society*. Harper and Row.

Janssen, A., & Geiser, C. (2012). Cross-cultural differences in spatial abilities and solution strategies: An investigation in Cambodia and Germany. *Journal of Cross-Cultural Psychology*, 43, 533–557. <https://doi.org/10.1177/0022022111399646>

Katz, E. (1961). The social itinerary of technical change: Two studies on diffusion of an innovation. *Human Organization*, 20, 70-82.

Kirkland, K., & Sutch, D. (2009). *Overcoming the barriers to educational innovation*. A literature review. Retrieved from [www.futurelab.org.uk/projects/map-of-innovations](http://www.futurelab.org.uk/projects/map-of-innovations)

Korpershoek, H., Harms, T., Boer, H., Kuijk, M., & Doolaard, S. (2016). A Meta-Analysis of the Effects of Classroom Management Strategies and Classroom Management Programs on Students' Academic, Behavioral, Emotional, and Motivational Outcomes. *Review of Educational Research*. American Educational Research Association, 86 (3), 643-680. Retrieved from <https://www.jstor.org/stable/24752878?seq=1>

Klapp, A. (2015). Does grading affect educational attainment? A longitudinal study. *Assessment in Education: Principles, Policy & Practice*, 22(3), 302-323. <https://doi.org/10.1080/0969594X.2014.988121>

Klieme, E., Pauli, C., & Reusser, K. (2009). The Pythagoras Study. In J. Tomás & T. Seidel (Eds.), *The power of video studies in investigating teaching and learning in the classroom* (pp. 137-160). Waxmann, Münster.

Koutrouba, K., Markarian, D. A., & Sardianou, E. (2018). Classroom Management Style: Greek Teachers' Perceptions. *International Journal of Instruction*, 11(4), 641-656. Retrieved from <https://eric.ed.gov/?id=EJ1191695>

Kunter, M., & Voss, T. (2013). The model of instructional quality in COACTIV: A multicriteria analysis. In M. Kunter et al. (Eds.), *Cognitive Activation in the Mathematics Classroom and Professional Competence of Teachers*. Springer. [http://dx.doi.org/10.1007/978-1-4614-5149-5\\_6](http://dx.doi.org/10.1007/978-1-4614-5149-5_6)

Lau, A. M. S. (2016). Formative good, summative bad? – A review of the dichotomy in assessment literature. *Journal of Further and Higher Education*, 40(4), 509–525.  
<https://doi.org/10.1080/0309877X.2014.984600>

Louis, K. S., Kruse, S. D., & Associates. (1995). *Professionalism and Community: Perspectives on Reforming Urban Schools* Thousand Oaks. CA: Corwin Press Inc

McLeod, J., Fisher, J., & Hoover, G. (2003). *The key elements of classroom management: Managing time and space, student behavior, and instructional strategies*. Association for Supervision and Curriculum Development.

Manning, K. C., Bearden, W. O., & Madden, T. J. (1995). Consumer innovativeness and adoption process. *Journal of Consumer Psychology*, 4(4), 329-345.  
[http://dx.doi.org/10.1207/s15327663jcp0404\\_02](http://dx.doi.org/10.1207/s15327663jcp0404_02)

Midgley, D. F. (1977). *Innovation and new product marketing*. Wiley.

Midgley, D. F., & Dowling, G. R. (1978). Innovativeness: The concept and its measurement. *Journal of Consumer Research*, 4, 229-242. <https://doi.org/10.1086/208701>

Moore, G. A. (1999). *Crossing the chasm (2nd ed.)*. HarperCollins

Morine-Dershimer, G. (2011). Classroom Management and Classroom Discourse [Ch. 6]. In C. M. Evertson & C. S. Weinstein (Eds.). *Handbook of classroom management: research, practice, and contemporary issues*. Routledge.

Mun, Y. Y., Kirk, D. F., & Jae, S. P. (2006). Understanding the role of individual innovativeness in the acceptance of IT-based innovations: Comparative Analyses of Models and Measures. *Decision Sciences*, 37(3), 393–426.  
<https://doi.org/10.1111/j.1540-5414.2006.00132.x>

National School Climate Council (2007). *The school climate challenge: narrowing the gap between school climate research and school climate policy, practice guidelines and teacher education policy*. Retrieved from <http://www.ecs.org/school-climate>.

Nikandrov, N. D. (2014). Teaching Methods: Tradition and Innovation. *International Review of Education / Internationale Zeitschrift für Erziehungswissenschaft / Revue Internationale de l'Education*, 36(2), 251-260. Retrieved from <http://www.jstor.org/stable/3444565>

Oddone, F. (2016). Self-Efficacy: a booster for pedagogical innovation. *Journal of e-Learning and Knowledge Society*, 12(3). Italian e-Learning Association. Retrieved from <https://www.learntechlib.org/p/173476/>

OECD. (2004). *Problem solving for tomorrow's world*. Paris: OECD.

OECD. (2009). *PIAAC problem solving in technology-rich environments*. Paris: OECD.

OECD. (2014). *PISA 2012 results: Creative problem solving*. Paris: OECD.

OECD. (2018). *Teaching and Learning International Survey (TALIS) 2018 Conceptual Framework*. EDU/WKP (2018)23.

OECD. (2019a). Kazakhstan - Country Note - TALIS 2018 Results. *Teachers and School Leaders as Lifelong Learners, 1*, 1-6.

Retrieved from [https://www.oecd.org/education/talis/TALIS2018\\_CN\\_KAZ.pdf](https://www.oecd.org/education/talis/TALIS2018_CN_KAZ.pdf)

OECD. (2019b). *TALIS 2018 Technical Report*. OECD, Paris. Retrieved from [http://www.oecd.org/education/talis/TALIS\\_2018\\_Technical\\_Report.pdf](http://www.oecd.org/education/talis/TALIS_2018_Technical_Report.pdf)

OECD. (2019c). *TALIS 2018 Results (Volume I): Teachers and School Leaders as Lifelong Learners*. TALIS, OECD Publishing, Paris. <https://doi.org/10.1787/1d0bc92a-en>

Peters, J. H. (2012). Are they ready? Final year preservice teachers' learning about managing student behaviour. *Australian Journal of Teacher Education*, 37, 18-42. doi: 10.14221/ajte.2012v37

Pellegrino, J. W. (2016). Introduction to special section of educational psychologist on educational assessment: validity arguments and evidence—blending cognitive, instructional, and measurement models and methods. *Educational Psychologist*, 51(1), 57-58. <https://doi.org/10.1080/00461520.2016.1150786>

Pepper, D. (2013). *KeyCoNet 2013 Literature Review: Assessment for key competencies*. KeyCoNet 2013.

R Core Team. (2018). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria. Available online at <https://www.R-project.org/>.

Rakoczy, K., Klieme, E., Drollinger-Vetter, B., Lipowsky, F., Pauli, C., & Reusser, K. (2007). Structure as a quality feature in mathematics instruction of the learning environment vs. a structured presentation of learning content. In M. Prenzel (Eds), *Studies on the educational quality of schools* (pp. 101–120). The final report of the DFG Priority Programme. Waxmann, Münster.

Roache, J. E., & Lewis, R. (2011). The carrot, the stick, or the relationship: What are the effective disciplinary strategies? *European Journal of Teacher Education*, 34(2), 233–248. <https://doi.org/10.1080/02619768.2010.542586>

Robin Jung Cheng, C., Hsin Chih, L., Yi Lung, H., & Chuan Chung, H. (2020). Which is more influential on teaching practice, classroom management efficacy or instruction efficacy? Evidence from TALIS 2018. *Asia Pacific Education Review*, 21, 589–599. Retrieved from <https://link.springer.com/article/10.1007/s12564-020-09656-8>

Rogers, E. M., & Shoemaker, F. F. (1971). *Communication of innovations*. Free Press

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). Free Press

Rogers, B. (2011). *Classroom Behaviour: A Practical Guide to Effective Teaching, Behaviour Management and Colleague Support*. Sage Publications.

Scheerens, J. (2008). Review and meta-analyses of school and teaching effectiveness.

*Bundesministerium für Bildung und Forschung* (BMBF). Retrieved from

[https://link.springer.com/chapter/10.1007/978-94-017-7459-8\\_8](https://link.springer.com/chapter/10.1007/978-94-017-7459-8_8)

Scherer, R., & Beckmann, J. F. (2014). The acquisition of problem-solving competence: evidence from 41 countries that math and science education matters. *Large-scale Assessments in Education*, 2(1). doi:10.1186/s40536-014-0010-7

Schlesinger, L., & Jentsch, A. (2016). Theoretical and methodological challenges in measuring instructional quality in mathematics education using classroom observations. *ZDM*, 48(1-2), 29–40. doi:10.1007/s11858-016-0765-0

Schneider, M., & Stern, E. (2010). The cognitive perspective on learning: ten cornerstone findings. ETH Zurich, Institute for Behavioural Research [Ch.3]. In H. Dumont, D. Istance, & F. Benavides (Eds.), *The Nature of Learning: Using Research to Inspire Practice*. OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264086487-en>.

Schwichow, M., Croker, S., Zimmerman, C., Höffler, T., & Härtig, H. (2016). Teaching the control-of-variables strategy: A meta-analysis. *Developmental Review*, 39, 37–63. doi:10.1016/j.dr.2015.12.001

- Schweizer, T. S. (2006). The Psychology of Novelty-Seeking, Creativity, and Innovation: Neurocognitive Aspects Within a Work-Psychological Perspective. *Creativity and Innovation Management*, 15(2), 164–172. doi:10.1111/j.1467-8691.2006.00383.x
- Shamatov, D. A. (2006). *Beginning teachers' professional socialization in post-soviet Kyrgyzstan: challenges and coping strategies* [Doctoral dissertation]. The University of Toronto.
- Shuell, T. J. (1996). Teaching and learning in a classroom context. In D.C. Berliner & R.C. Calfee (Eds), *Handbook of educational psychology* (pp. 726–764). Simon & Schuster Macmillan.
- Shulman, L. (1987). Knowledge and Teaching: Foundations of a New Reform. *Harvard Educational Review*, 57(1), 1-22.  
<https://doi.org/10.17763/haer.57.1.j463w79r56455411>
- Siarova, H., Sternadel, D., & Mašidlauskaitė, R. (2017). *Assessment practices for 21st-century learning: review of evidence*. NESET II report, Luxembourg: Publications Office of the European Union. doi: 10.2766/71491.
- Simonton, D.K. (1975) Sociocultural context of individual creativity. *Journal of Personality and Social Psychology*, 32(11), 19–33. <https://doi.org/10.1037/0022-3514.32.6.1119>
- Stough, L. (2006). The place of classroom management and standards in teacher education. In C. M. Evertson & C. S. Weinstein (Eds.), *Handbook of classroom management: Research, practice, and contemporary issues* (pp. 909–923). Mahwah, NJ: Lawrence Erlbaum Associates.
- Terrail, J. P. (2016). *Pour une école de l'exigence intellectuelle. Changer de paradigme pédagogique*. Paris: La Dispute.

Tobias, S., & Duffy, T. M. (2009). *Constructivist instruction: Success or failure?* (1st ed.).  
Routledge.

Toole, J. C., & Louis, K. S. (2002). The Role of Professional Learning Communities in  
International Education. In K. Leithwood & P. Hallinger (Eds.), *Second  
International Handbook of Educational Leadership and Administration*. Dordrecht:  
Kluwer.

van Tartwijk, J., & Hammerness, K. (2011). The neglected role of classroom management in  
teacher education. *Teaching Education*, 22(2), 109-112.

<http://dx.doi.org/10.1080/10476210.2011.567836>

Vieluf, S., Kaplan, D., Klieme, E., & Bayer, S. (2012). *Teaching Practices and Pedagogical  
Innovation: Evidence from TALIS*. OECD Publishing, 1-174.

<http://dx.doi.org/10.1787/9789264123540-en>

Wang, M., & Degol, J. L. (2016). School Climate: A Review of the Construct, Measurement,  
and Impact on Student Outcomes. *Educational Psychology Review*, 28(2), 315–352.

Retrieved from <https://link.springer.com/article/10.1007/s10648-015-9319-1>

Wellington, J. (2014). *Educational research. Contemporary issues and practical approaches*  
(2nd ed.). Bloomsbury Publishing

Wickham, H., & Lionel, H. (2020). Tidy: Tidy Messy Data. Retrieved from

<https://CRAN.R-project.org/package=tidyr>.

## Appendix A

```
rm(list=ls())
getwd()
dir()

##### 1. Reading in TALIS Teacher Data #####
install.packages("haven")
library("haven")
talis.teacher <- haven::read_sav("BTGKAZT3_TALIS_Teacher.sav")
talis.principal <- haven::read_sav("BCGKAZT3_TALIS_Principal.sav")

##### 2. Exploring the data #####
# (a) using nrow and ncol functions on the data frames
dim(talis.teacher)
dim(talis.principal)

# (b) trying to find the variables of interest
colnames(talis.teacher)
print(colnames)
colnames(talis.principal)
print(colnames)
# (c) exploring attributes(df$variable): This reviews SPSS variable labels
attributes(talis.teacher$IDCNTRY)
attributes(talis.principal$IDCNTRY)

table(talis.teacher$IDCNTRY)
table(talis.principal$IDCNTRY)

##### 3. Subsetting the TALIS teacher and principal data to only include Kazakhstan
##### Subsetting Teachers #####
class(talis.teacher)
```

## TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
str(talis.teacher)
dim(talis.teacher)
colnames(talis.teacher)
length(unique(talis.teacher$IDCNTRY))
head(talis.teacher)
talis.teacher[talis.teacher$IDCNTRY== 398, ]
df.kaz.talis.teacher <- talis.teacher[talis.teacher$IDCNTRY== 398, ]
head(df.kaz.talis.teacher)
dim(df.kaz.talis.teacher)

#### Subsetting principal ####
class(talis.principal)
str(talis.principal)
dim(talis.principal)
length(unique(talis.principal$IDCNTRY))
head(talis.principal)
talis.principal[talis.principal$IDCNTRY== 398, ]
df.kaz.talis.principal <-talis.principal[talis.principal$IDCNTRY== 398, ]
head(df.kaz.talis.principal)
dim(df.kaz.talis.principal)

#### 4. Merging the TALIS principal and teacher datasets to create a master dataset names(df.kaz.talis.teacher)[1:10]
head(df.kaz.talis.teacher)
names(df.kaz.talis.teacher)[1:10]
df.kaz.talis.teacher$TT3G20A
head(df.kaz.talis.principal)
names(df.kaz.talis.principal)[1:10]
df.kaz.talis.principal$T3PACAD
length(unique(df.kaz.talis.teacher$IDSCHOOL))
length(unique(df.kaz.talis.principal$IDSCHOOL))
talis.teach.school <- merge(df.kaz.talis.teacher, df.kaz.talis.principal, all.x = T, by = "IDSCHOOL")
dim(talis.teach.school)
```

##### 5. Exploring the merged data frame

```
head(talis.teach.school)
dim(talis.teach.school)
names(talis.teach.school)
class(talis.teach.school)
length(talis.teach.school)
str(talis.teach.school)
```

##### 6. Identifying the variables to include in study

```
project.variable.Logic <- colnames(talis.teach.school) %in% c
  ("IDSCHOOL", "IDTEACH", "IDLANG", "IDCNTRY", "CNTRY", "IDCNTRYR", "IDCNTPOP",
   "SCHLOC", "TCHAGEGR", "PRAGEGR", "TT3G01", "TC3G03",
   "TC3G12", "TC3G10", "TT3G11B", "TT3G02", "TC3G02", "TT3G03",
   "T3TPRA", "T3CLAIN", "TT3G42", "TT3G42A", "TT3G42B", "TT3G42C",
   "TT3G42D", "T3CLASM", "TT3G42I", "TT3G42J", "TT3G42K",
   "TT3G42L", "T3COGAC", "TT3G42E", "TT3G42F", "TT3G42G",
   "TT3G42H", "T3SELF", "T3SECLS", "TT3G34",
   "TT3G34D", "TT3G34F", "TT3G34H", "TT3G34I", "T3SEINS",
   "TT3G34C", "TT3G34J", "TT3G34K", "TT3G34L", "T3SEENG",
   "TT3G34A", "TT3G34B", "TT3G34E", "TT3G34G", "TT3G43A", "TT3G43B", "TT3G43C", "TT3G43D", "T3SATAT", "TT3G40",
   "TT3G40A",
   "TT3G40B", "TT3G40C", "TT3G40D", "TT3G40E", "T3STBEH",
   "TT3G52", "TT3G52F", "TT3G52G", "TT3G52H", "T3DISC", "TT3G41", "TT3G41A", "TT3G41B", "TT3G41C", "TT3G41D",
   "T3PDPED", "TT3G27", "TT3G27A", "TT3G27B", "TT3G27C", "TT3G27D", "TT3G27F", "T3PORGIN", "T3TEAM", "TT3G32",
   "TT3G32A", "TT3G32B", "TT3G32C", "TT3G32D", "T3PORGIN", "TC3G28", "TC3G28A", "TC3G28B", "TC3G28C", "TC3G28D")
project.df <- talis.teach.school[, project.variable.Logic]
head(project.df)
dim(project.df)
```

##### 7. Checking the number of complete cases

```
total.complete.cases <- sum(complete.cases(project.df))
```

## TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
print(total.complete.cases) #5874
percentage.complete <-total.complete.cases/ nrow(project.df) *100
print(percentage.complete) # 89.46086
```

### #### 8. Removing missing data

```
library("tidyr")
removed <- project.df %>% tidyr::drop_na()
dim(removed)
```

### #### 9. Checking variation in variables within schools: removing singletons

```
str(removed)
head(removed)
colnames(removed)
sort(table(removed$IDSCHOOL)) # at least 4 teachers (no singletons)
dim(removed) # 5874 78
```

### #### 10. Check variation in all variables 'within schools': remove schools with no variation

### #### Checking teacher- level variables variations in schools

#### # Teacher gender

```
removed$TT3G01
summary(removed$TT3G01)
table(removed$TT3G01)
TT3G01.Sds <- tapply(removed$TT3G01, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G01.Sds)
Sch.no.G.sd <- names(which(sort(TT3G01.Sds) == 0))
print(Sch.no.G.sd)
length(Sch.no.G.sd) # 9
IDSCH.Gen.v.logical <- !removed$IDSCHOOL %in% Sch.no.G.sd
removed <- removed[IDSCH.Gen.v.logical, ]
dim(removed) ### 5745 78
sum(is.na(TT3G01.Sds))
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
# Teacher age
removed$TCHAGEGR
summary(removed$TCHAGEGR)
table(removed$TCHAGEGR)
TCHAGEGR.Sds <- tapply(removed$TCHAGEGR, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TCHAGEGR.Sds)
dim(removed) # 5745 78
```

```
# Years of work experience as a teacher in total
removed$TT3G11B
summary(removed$TT3G11B)
table(removed$TT3G11B)
TT3G11B.Sds <- tapply(removed$TT3G11B, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G11B.Sds)
dim(removed) # 5745 78
```

```
##### Team innovativeness
removed$T3TEAM
summary(removed$T3TEAM)
table(removed$T3TEAM)
T3TEAM.Sds <- tapply(removed$T3TEAM, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(T3TEAM.Sds)
dim(removed) # 5745 78
```

```
# TT3G32A Most teachers in this school strive to develop new ideas for teaching and learning.
removed$TT3G32A
summary(removed$TT3G32A)
table(removed$TT3G32A)
TT3G32A.Sds <- tapply(removed$TT3G32A, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G32A.Sds)
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
dim(removed) # 5745 78
```

```
# TT3G32B Most teachers in this school are open to change
```

```
removed$TT3G32B
```

```
summary(removed$TT3G32B)
```

```
table(removed$TT3G32B)
```

```
TT3G32B.Sds <- tapply(removed$TT3G32B, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
```

```
sort(TT3G32B.Sds)
```

```
dim(removed) # 5745 78
```

```
# TT3G32C Most teachers in this school search for new ways to solve problems.
```

```
removed$TT3G32C
```

```
summary(removed$TT3G32C)
```

```
table(removed$TT3G32C)
```

```
TT3G32C.Sds <- tapply(removed$TT3G32C, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
```

```
sort(TT3G32C.Sds)
```

```
dim(removed) # 5745 78
```

```
# TT3G32D Most teachers in this school provide practical support to each other for the application of new ideas.
```

```
removed$TT3G32D
```

```
summary(removed$TT3G32D)
```

```
table(removed$TT3G32D)
```

```
TT3G32D.Sds <- tapply(removed$TT3G32D, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
```

```
sort(TT3G32D.Sds)
```

```
dim(removed) # 5745 78
```

```
##### Needs for professional development in subject matter and pedagogy
```

```
removed$T3PDPED
```

```
summary(removed$T3PDPED)
```

```
table(removed$T3PDPED)
```

```
T3PDPED.Sds <- tapply(removed$T3PDPED, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
```

```
sort(T3PDPED.Sds)
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
dim(removed) # 5745 78
# TT3G27A Knowledge and understanding of my subject field(s)
removed$TT3G27A
summary(removed$TT3G27A)
table(removed$TT3G27A)
TT3G27A.Sds <- tapply(removed$TT3G27A, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G27A.Sds)
dim(removed) # 5745 78
# TT3G27B Pedagogical competencies in teaching my subject field(s)
removed$TT3G27B
summary(removed$TT3G27B)
table(removed$TT3G27B)
TT3G27B.Sds <- tapply(removed$TT3G27B, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G27B.Sds)
dim(removed) # 5745 78
# TT3G27C Knowledge of the curriculum
removed$TT3G27C
summary(removed$TT3G27C)
table(removed$TT3G27C)
TT3G27C.Sds <- tapply(removed$TT3G27C, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G27C.Sds)
dim(removed) # 5745 78
# TT3G27D Student assessment practices
removed$TT3G27D
summary(removed$TT3G27D)
table(removed$TT3G27D)
TT3G27D.Sds <- tapply(removed$TT3G27D, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G27D.Sds)
dim(removed) # 5745 78
# TT3G27F Student behaviour and classroom management
removed$TT3G27F
summary(removed$TT3G27F)
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
table(removed$TT3G27F)
TT3G27F.Sds <- tapply(removed$TT3G27F, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G27F.Sds)
dim(removed) # 5745 78
##### T3DISC: Teachers? perceived disciplinary climate
removed$T3DISC
summary(removed$T3DISC)
table(removed$T3DISC)
T3DISC.Sds <- tapply(removed$T3DISC, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(T3DISC.Sds)
dim(removed) # 5745 78
# TT3G41A When the lesson begins, I have to wait quite a long time for students to quieten down
removed$TT3G41A
summary(removed$TT3G41A)
table(removed$TT3G41A)
TT3G41A.Sds <- tapply(removed$TT3G41A, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G41A.Sds)
dim(removed) # 5745 78
# TT3G41B Students in this class take care to create a pleasant learning atmosphere
removed$TT3G41B
summary(removed$TT3G41B)
table(removed$TT3G41B)
TT3G41B.Sds <- tapply(removed$TT3G41B, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G41B.Sds)
dim(removed) # 5745 78
# TT3G41C I lose quite a lot of time because of students interrupting the lesson
removed$TT3G41C
summary(removed$TT3G41C)
table(removed$TT3G41C)
TT3G41C.Sds <- tapply(removed$TT3G41C, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G41C.Sds)
dim(removed) # 5745 78
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
# TT3G41D There is much disruptive noise in this classroom
removed$TT3G41D
summary(removed$TT3G41D)
table(removed$TT3G41D)
TT3G41D.Sds <- tapply(removed$TT3G41D, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G41D.Sds)
dim(removed) # 5745 78
##### T3STBEH: Student behaviour stress
removed$T3STBEH
summary(removed$T3STBEH)
table(removed$T3STBEH)
T3STBEH.Sds <- tapply(removed$T3STBEH, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(T3STBEH.Sds)
dim(removed) # 5745 78
# TT3G52F Being held responsible for students? achievement
removed$TT3G52F
summary(removed$TT3G52F)
table(removed$TT3G52F)
TT3G52F.Sds <- tapply(removed$TT3G52F, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G52F.Sds)
dim(removed) # 5745 78
# TT3G52G Maintaining classroom discipline
removed$TT3G52G
summary(removed$TT3G52G)
table(removed$TT3G52G)
TT3G52G.Sds <- tapply(removed$TT3G52G, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G52G.Sds)
dim(removed) # 5745 78
# TT3G52H Being intimidated or verbally abused by students
removed$TT3G52H
summary(removed$TT3G52H)
table(removed$TT3G52H)
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
TT3G52H.Sds <- tapply(removed$TT3G52H, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G52H.Sds)
dim(removed) # 5745 78
##### T3SATAT: Satisfaction with target class autonomy
removed$T3SATAT
summary(removed$T3SATAT)
table(removed$T3SATAT)
T3SATAT.Sds <- tapply(removed$T3SATAT, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(T3SATAT.Sds)
dim(removed) # 5745 78
# TT3G40A Determining course content
removed$TT3G40A
summary(removed$TT3G40A)
table(removed$TT3G40A)
TT3G40A.Sds <- tapply(removed$TT3G40A, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G40A.Sds)
dim(removed) # 5745 78
# TT3G40B Selecting teaching methods
removed$TT3G40B
summary(removed$TT3G40B)
table(removed$TT3G40B)
TT3G40B.Sds <- tapply(removed$TT3G40B, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G40B.Sds)
dim(removed) # 5745 78
# TT3G40C Assessing students? learning
removed$TT3G40C
summary(removed$TT3G40C)
table(removed$TT3G40C)
TT3G40C.Sds <- tapply(removed$TT3G40C, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G40C.Sds)
dim(removed) # 5745 78
# TT3G40D Disciplining students
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
removed$TT3G40D
summary(removed$TT3G40D)
table(removed$TT3G40D)
TT3G40D.Sds <- tapply(removed$TT3G40D, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G40D.Sds)
dim(removed) # 5745 78
# TT3G40E Determining the amount of homework to be assigned
removed$TT3G40E
summary(removed$TT3G40E)
table(removed$TT3G40E)
TT3G40E.Sds <- tapply(removed$TT3G40E, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G40E.Sds)
dim(removed) # 5745 78
##### Teaching practices
# a) I administer my own assessment
removed$TT3G43A
summary(removed$TT3G43A)
table(removed$TT3G43A)
TT3G43A.Sds <- tapply(removed$TT3G43A, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G43A.Sds)
dim(removed) # 5745 78
# b) I provide written feedback on student work in addition to a <mark, i.e. numeric score or letter grade
removed$TT3G43B
summary(removed$TT3G43B)
table(removed$TT3G43B)
TT3G43B.Sds <- tapply(removed$TT3G43B, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G43B.Sds)
dim(removed) # 5745 78
# c) I let students evaluate their own progress
removed$TT3G43C
summary(removed$TT3G43C)
table(removed$TT3G43C)
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
TT3G43C.Sds <- tapply(removed$TT3G43C, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G43C.Sds)
dim(removed) # 5757 66
Sch.no.G.sd <- names(which(sort(TT3G43C.Sds) == 0))
print(Sch.no.G.sd)
length(Sch.no.G.sd) # 2
IDSCH.Gen.v.logical <- !removed$IDSCHOOL %in% Sch.no.G.sd
removed <- removed[IDSCH.Gen.v.logical, ]
dim(removed) ### 5735 78
sum(is.na(TT3G01.Sds)) # 0
dim(removed)
removed$TT3G43C
summary(removed$TT3G43C)
table(removed$TT3G43C)
TT3G43C.Sds <- tapply(removed$TT3G43C, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G43C.Sds)
dim(removed) # 5735 78
# d) I observe students when working on particular tasks and provide immediate feedback
removed$TT3G43D
summary(removed$TT3G43D)
table(removed$TT3G43D)
TT3G43D.Sds <- tapply(removed$TT3G43D, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G43D.Sds)
dim(removed) # 5735 78
##### TT3SELF: Teacher self-efficacy, composite #####
removed$T3SELF
attributes(removed$T3SELF)
summary(removed$T3SELF)
table(removed$T3SELF)
T3SELF.Sds <- tapply(removed$T3SELF, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(T3SELF.Sds)
dim(removed) # 5735 78
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
##### Self-Efficacy in the Classroom: overall
#### a) T3SECLS Self-efficacy in classroom management (overall)
removed$T3SECLS
attributes(removed$T3SECLS)
summary(removed$T3SECLS)
table(removed$T3SECLS)
T3SECLS.Sds <- tapply(removed$T3SECLS, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(T3SECLS.Sds)
dim(removed) # 5735 78
#####The four items #####
# TT3G34D Control disruptive behaviour in the classroom
removed$TT3G34D
summary(removed$TT3G34D)
table(removed$TT3G34D)
TT3G34D.Sds <- tapply(removed$TT3G34D, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G34D.Sds)
dim(removed) # 5735 78

#### Self Efficacy in Classroom Management ####
removed$TT3G34F
summary(removed$TT3G34F)
table(removed$TT3G34F)
TT3G34F.Sds <- tapply(removed$TT3G34F, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G34F.Sds)
dim(removed) # 5735 78

removed$TT3G34H
summary(removed$TT3G34H)
table(removed$TT3G34H)
TT3G34H.Sds <- tapply(removed$TT3G34H, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G34H.Sds)
dim(removed) # 5735 78
```

```
removed$TT3G34I
summary(removed$TT3G34I)
table(removed$TT3G34I)
TT3G34I.Sds <- tapply(removed$TT3G34I, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G34I.Sds)
dim(removed) # 5735 78
##### Self-Efficacy in Instruction: overall

#### a) T3SECLS Self-efficacy in classroom management (overall)
removed$T3SEINS
attributes(removed$T3SEINS)
summary(removed$T3SEINS)
table(removed$T3SEINS)
T3SEINS.Sds <- tapply(removed$T3SEINS, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(T3SEINS.Sds)
dim(removed) # 5735 78

#####The four items #####
# TT3G34D Control disruptive behaviour in the classroom
removed$TT3G34C
summary(removed$TT3G34C)
table(removed$TT3G34C)
TT3G34C.Sds <- tapply(removed$TT3G34C, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G34C.Sds)
dim(removed) # 5735 78

#### Self Efficacy in Classroom Management ####
removed$TT3G34J
summary(removed$TT3G34J)
table(removed$TT3G34J)
TT3G34J.Sds <- tapply(removed$TT3G34J, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
sort(TT3G34J.Sds)
dim(removed) # 5735 78
```

```
removed$TT3G34K
summary(removed$TT3G34K)
table(removed$TT3G34K)
TT3G34K.Sds <- tapply(removed$TT3G34K, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G34K.Sds)
dim(removed) # 5735 78
```

```
removed$TT3G34L
summary(removed$TT3G34L)
table(removed$TT3G34L)
TT3G34L.Sds <- tapply(removed$TT3G34L, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G34L.Sds)
dim(removed) # 5750 65
Sch.no.G.sd <- names(which(sort(TT3G34L.Sds) == 0))
print(Sch.no.G.sd)
length(Sch.no.G.sd) # 3120
IDSCH.Gen.v.logical <- !removed$IDSCHOOL %in% Sch.no.G.sd
removed <- removed[IDSCH.Gen.v.logical, ]
dim(removed) ### 5719 78
sum(is.na(TT3G01.Sds))
##### Self-Efficacy in Student Engagement: overall
#### a) T3SEENG Self-efficacy in student engagement (overall)
removed$T3SEENG
attributes(removed$T3SEENG)
summary(removed$T3SEENG)
table(removed$T3SEENG)
T3SEENG.Sds <- tapply(removed$T3SEENG, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(T3SEENG.Sds)
dim(removed) # 5719 78
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
##### The four items #####  
# TT3G34D Control disruptive behaviour in the classroom  
removed$TT3G34A  
summary(removed$TT3G34A)  
table(removed$TT3G34A)  
TT3G34A.Sds <- tapply(removed$TT3G34A, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))  
sort(TT3G34A.Sds)  
dim(removed) #5719 78
```

```
#### Self Efficacy in Classroom Management ####  
removed$TT3G34B  
summary(removed$TT3G34B)  
table(removed$TT3G34B)  
TT3G34B.Sds <- tapply(removed$TT3G34B, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))  
sort(TT3G34B.Sds)  
dim(removed) # 5719 78
```

```
removed$TT3G34E  
summary(removed$TT3G34E)  
table(removed$TT3G34E)  
TT3G34E.Sds <- tapply(removed$TT3G34E, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))  
sort(TT3G34E.Sds)  
dim(removed) #5719 78
```

```
removed$TT3G34G  
summary(removed$TT3G34G)  
table(removed$TT3G34G)  
TT3G34G.Sds <- tapply(removed$TT3G34G, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))  
sort(TT3G34G.Sds)  
dim(removed) # 5750 65  
Sch.no.G.sd <- names(which(sort(TT3G34G.Sds) == 0))
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
print(Sch.no.G.sd)
length(Sch.no.G.sd) # 3227
IDSCH.Gen.v.logical <- !removed$IDSCHOOL %in% Sch.no.G.sd
removed <- removed[IDSCH.Gen.v.logical, ]
dim(removed) ### 5715 78
sum(is.na(TT3G01.Sds))
##### Teaching practices include (a) clarity of instruction, and (b) cognitive activation.
##### Teaching practices, composite
removed$T3TPRA
summary(removed$T3TPRA)
table(removed$T3TPRA)
T3TPRA.Sds <- tapply(removed$T3TPRA, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(T3TPRA.Sds)
dim(removed) # 5715 78

#### a) Clarity of instruction (subscale)
removed$T3CLAIN
summary(removed$T3CLAIN)
table(removed$T3CLAIN)
T3CLAIN.Sds <- tapply(removed$T3CLAIN, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(T3CLAIN.Sds)
dim(removed) # 5715 78

# TT3G42A I present a summary of recently learned content
removed$TT3G42A
summary(removed$TT3G42A)
table(removed$TT3G42A)
TT3G42A.Sds <- tapply(removed$TT3G42A, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G42A.Sds)
dim(removed) # 5715 78

# TT3G42B I set goals at the beginning of instruction
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
removed$TT3G42B
summary(removed$TT3G42B)
table(removed$TT3G42B)
TT3G42B.Sds <- tapply(removed$TT3G42B, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G42B.Sds)
dim(removed) # 5747 66
Sch.no.G.sd <- names(which(sort(TT3G42B.Sds) == 0))
print(Sch.no.G.sd) # "3101" "3150" "3318" ***
length(Sch.no.G.sd) # 3227
IDSCH.Gen.v.logical <- !removed$IDSCHOOL %in% Sch.no.G.sd
removed <- removed[IDSCH.Gen.v.logical, ]
dim(removed) ### 5669 78
sum(is.na(TT3G01.Sds))
```

```
# TT3G42C I explain what I expect the students to learn
removed$TT3G42C
summary(removed$TT3G42C)
table(removed$TT3G42C)
TT3G42C.Sds <- tapply(removed$TT3G42C, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G42C.Sds)
dim(removed) # 5747 66
Sch.no.G.sd <- names(which(sort(TT3G42C.Sds) == 0))
print(Sch.no.G.sd) # "3208" "3240"***
length(Sch.no.G.sd) # 3227
IDSCH.Gen.v.logical <- !removed$IDSCHOOL %in% Sch.no.G.sd
removed <- removed[IDSCH.Gen.v.logical, ]
dim(removed) ### 5643 78
sum(is.na(TT3G01.Sds))
```

```
# TT3G42D I explain how new and old topics are related
removed$TT3G42D
summary(removed$TT3G42D)
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
table(removed$TT3G42D)
TT3G42D.Sds <- tapply(removed$TT3G42D, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G42D.Sds)
dim(removed) # 5643 78
```

```
##### b) Classroom management (subscale) T3CLASM #####
removed$T3CLASM
summary(removed$T3CLASM)
table(removed$T3CLASM)
T3CLASM.Sds <- tapply(removed$T3CLASM, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(T3CLASM.Sds)
dim(removed) # 5643 78
```

```
# TT3G42I I tell students to follow classroom rules
removed$TT3G42I
summary(removed$TT3G42I)
table(removed$TT3G42I)
TT3G42I.Sds <- tapply(removed$TT3G42I, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G42I.Sds)
dim(removed) # 5643 78
```

```
# TT3G42J I tell students to listen to what I say
removed$TT3G42J
summary(removed$TT3G42J)
table(removed$TT3G42J)
TT3G42J.Sds <- tapply(removed$TT3G42J, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G42J.Sds)
dim(removed) # 5643 78
```

```
# TT3G42K I calm students who are disruptive
removed$TT3G42K
summary(removed$TT3G42K)
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
table(removed$TT3G42K)
TT3G42K.Sds <- tapply(removed$TT3G42K, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G42K.Sds)
dim(removed) # 5643 78
```

```
# TT3G42L When the lesson begins, I tell students to quieten down quickly
removed$TT3G42L
summary(removed$TT3G42L)
table(removed$TT3G42L)
TT3G42L.Sds <- tapply(removed$TT3G42L, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G42L.Sds)
dim(removed) # 5643 78
```

```
#### c) Cognitive activation (subscale) T3COGAC
removed$T3COGAC
summary(removed$T3COGAC)
table(removed$T3COGAC)
T3COGAC.Sds <- tapply(removed$T3COGAC, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(T3COGAC.Sds)
dim(removed) #5643 78
```

```
# TT3G42E I present tasks for which there is no obvious solution
removed$TT3G42E
summary(removed$TT3G42E)
table(removed$TT3G42E)
TT3G42E.Sds <- tapply(removed$TT3G42E, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G42E.Sds)
dim(removed) # 5643 78
```

```
# TT3G42F I give tasks that require students to think critically
removed$TT3G42F
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
summary(removed$TT3G42F)
table(removed$TT3G42F)
TT3G42F.Sds <- tapply(removed$TT3G42F, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G42F.Sds)
dim(removed) # 5747 66
Sch.no.G.sd <- names(which(sort(TT3G42F.Sds) == 0))
print(Sch.no.G.sd) # "3001" ***
length(Sch.no.G.sd) # 3227
IDSCH.Gen.v.logical <- !removed$IDSCHOOL %in% Sch.no.G.sd
removed <- removed[IDSCH.Gen.v.logical, ]
dim(removed) ### 5634 78
sum(is.na(TT3G01.Sds))

# TT3G42G I have students work in small groups to come up with a joint solution to a problem or task
removed$TT3G42G
summary(removed$TT3G42G)
table(removed$TT3G42G)
TT3G42G.Sds <- tapply(removed$TT3G42G, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G42G.Sds)
dim(removed) # 5634 78

# TT3G42H I ask students to decide on their own procedures for solving complex tasks
removed$TT3G42H
summary(removed$TT3G42H)
table(removed$TT3G42H)
TT3G42H.Sds <- tapply(removed$TT3G42H, removed$IDSCHOOL, FUN = function(x)sd(x, na.rm = T))
sort(TT3G42H.Sds)
dim(removed) # 5634 78
##### Descriptive statistics
options(max.print = 99999)
library("psych")
description.of.var <- psych::describe(removed)
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
focal.variables <- c("TT3G34D", "TT3G34F", "TT3G34H", "TT3G34I",
  "TT3G34A", "TT3G34B", "TT3G34E", "TT3G34G",
  "TT3G34C", "TT3G34J", "TT3G34K", "TT3G34L",
  "TT3G42A", "TT3G42B", "TT3G42C", "TT3G42D",
  "TT3G42E", "TT3G42F", "TT3G42G", "TT3G42H",
  "TT3G27A", "TT3G27B", "TT3G27C", "TT3G27D", "TT3G27F",

  "TT3G32A", "TT3G32B", "TT3G32C", "TT3G32D",
  "TC3G28A", "TC3G28B", "TC3G28C", "TC3G28D",
  "TCHAGEGR", "TT3G01", "TT3G02", "TC3G02", "TC3G02",
  "IDSCHOOL", "TT3G11B", "IDLANG"
)

description.of.var <- as.data.frame(description.of.var)

variables.to.describe <- description.of.var[rownames(description.of.var) %in% focal.variables, ]

apply(variables.to.describe, 2, FUN=function(x)round(x, 2))[,c(3,4,11)]

##### ICCs for within-school variables ##### These are the variables that vary within schools
head(removed)
colnames(removed) %in% focal.variables

df.for.ICCs <- removed[, colnames(removed) %in% focal.variables]
head(df.for.ICCs)

ICCs <- round(apply(df.for.ICCs, 2, FUN = function(x)misty::multilevel.icc(x, df.for.ICCs$IDSCHOOL)), 2)
print(ICCs)

install.packages("lavaan")
library("lavaan")
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

#### Measurement model ####

```
model <- 'SE.Class.man =~ TT3G34D + TT3G34F + TT3G34H + TT3G34I
SE.Student.eng =~ TT3G34A + TT3G34B + TT3G34E + TT3G34G
SE.Instruction =~ TT3G34C + TT3G34J + TT3G34K + TT3G34L
Clarity =~ TT3G42A + TT3G42B + TT3G42C + TT3G42D
Cog.act =~ TT3G42E + TT3G42F + TT3G42G + TT3G42H
prof.dev.need =~ TT3G27A + TT3G27B + TT3G27C + TT3G27D + TT3G27F
team.innov =~ TT3G32A + TT3G32B + TT3G32C + TT3G32D'
```

```
fit <- sem(model, removed, std.lv=TRUE, estimator = "ML")
summary(fit, fit.measures=TRUE) # SRMR .039, RMSEA .046, CFI .937, gammahat = .95, "4685.371/356 = 13.16 (p < .001)"
```

```
install.packages("semTools")
library("semTools")
options(scipen=9999)
round(semTools::moreFitIndices(fit), 3)
```

```
estim.M1 <- parameterestimates(fit, standardized=TRUE, rsquare=TRUE)
print(estim.M1)
```

```
# problem: TT3G34A (get student to believe they can do well) in factor of student engagement
# problem: TT3G42A (present a summary of recently learnt content) in factor of clarity of instruction * find theory to support removal of these items.
```

```
model <- 'SE.Class.man =~ TT3G34D + TT3G34F + TT3G34H + TT3G34I
SE.Student.eng =~ TT3G34B + TT3G34E + TT3G34G
SE.Instruction =~ TT3G34C + TT3G34J + TT3G34K + TT3G34L
Clarity =~ TT3G42B + TT3G42C + TT3G42D
Cog.act =~ TT3G42E + TT3G42F + TT3G42G + TT3G42H'
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
prof.dev.need =~ TT3G27A + TT3G27B + TT3G27C + TT3G27D + TT3G27F  
team.innov =~ TT3G32A + TT3G32B + TT3G32C + TT3G32D'
```

```
fit <- sem(model, removed, std.lv=TRUE, estimator = "ML")  
summary(fit, fit.measures=TRUE) # SRMR .033, RMSEA .044, CFI .949, gammahat = .958, "3654.893/303 = 12.06 (p < .001)"  
options(scipen=9999)  
round(semTools::moreFitIndices(fit), 3)  
estim.M1 <- parameterestimates(fit, standardized=TRUE, rsquare=TRUE)  
print(estim.M1[,c(1,2,3,7,11)])  
##### final structural model #####
```

```
model <- 'SE.Class.man =~ TT3G34D + TT3G34F + TT3G34H + TT3G34I  
SE.Student.eng =~ TT3G34B + TT3G34E + TT3G34G  
SE.Instruction =~ TT3G34C + TT3G34J + TT3G34K + TT3G34L  
Clarity =~ TT3G42B + TT3G42C + TT3G42D  
Cog.act =~ TT3G42E + TT3G42F + TT3G42G + TT3G42H  
prof.dev.need =~ TT3G27A + TT3G27B + TT3G27C + TT3G27D + TT3G27F  
team.innov =~ TT3G32A + TT3G32B + TT3G32C + TT3G32D
```

```
team.innov ~ SE.Class.man + SE.Student.eng + SE.Instruction + Clarity + Cog.act + prof.dev.need'
```

```
fit <- sem(model, removed, std.lv=TRUE, estimator = "ML")  
summary(fit, fit.measures=TRUE) # SRMR .033, RMSEA .044, CFI .949, gammahat = .958, "3654.893/303 = 12.06 (p < .001)"  
options(scipen=9999)  
round(semTools::moreFitIndices(fit), 3)  
estim.M1 <- parameterestimates(fit, standardized=TRUE, rsquare=TRUE)  
print(estim.M1[,c(1,2,3,7,11)])
```

```
removed$TCHAGEGR # 1 = under 25, 2 = 25-29, 3 = 30-39, 4 = 40-49, 5 = 50-59, 6 = 60+  
removed$TT3G01 # male = 2  
##### Final parsimonious model controlling for teacher gender and age #####  
model <- 'SE.Class.man =~ TT3G34D + TT3G34F + TT3G34H + TT3G34I
```

TEACHERS' INSTRUCTIONAL PRACTICES AND INNOVATION IN KAZAKHSTAN

```
SE.Student.eng =~ TT3G34B + TT3G34E + TT3G34G
SE.Instruction =~ TT3G34C + TT3G34J + TT3G34K + TT3G34L
Clarity =~ TT3G42B + TT3G42C + TT3G42D
Cog.act =~ TT3G42E + TT3G42F + TT3G42G + TT3G42H
prof.dev.need =~ TT3G27A + TT3G27B + TT3G27C + TT3G27D + TT3G27F
team.innov =~ TT3G32A + TT3G32B + TT3G32C + TT3G32D
```

```
team.innov ~ SE.Class.man + SE.Student.eng + SE.Instruction + Clarity + Cog.act + prof.dev.need + TT3G01 + TCHAGEGR + TT3G03'
```

```
fit <- sem(model, removed, std.lv=TRUE, estimator = "ML")
summary(fit, fit.measures=TRUE)          # SRMR .033, RMSEA .044, CFI .949, gammahat = .958, "3654.893/303 = 12.06 (p < .001)"
options(scipen=9999)
round(semTools::moreFitIndices(fit), 3)
estim.M1 <- parameterestimates(fit, standardized=TRUE, rsquare=TRUE)
print(estim.M1[,c(1,2,3,7,11)])
```