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The implementation of digital communication (DC) in parent-teacher partnership in China: teachers' and parents' views.

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Abstract

Focus

Two-way communication is at the heart of the Parent-Teacher Partnerships (PTPs) and paves the way for consistent and congruent perspectives and involvement from both parents and teachers. This study aims to investigate how Digital Communication (DC) has been implemented into the current education system in China, according to parents' and teachers' views. Specifically, this dissertation analyses (1) both parents' and teachers' views of DC using a modified version of the Digital Communication Scale (DCS), (2) how these views of DC are associated with personal characteristics of teachers and parents, and (3) how these views were reflected in three open-ended questions to both. The current study investigates the implications of PTPs guidance and policies and their collaborative DC patterns in China. At the same time, from the perspective of individual characteristics and the contents of DC, this study understood how individuals generate different opinions in DC, thus affecting the efficiency and quality of PTPs.

Research Design

Online surveys were selected as the data collection method, including a Chinese version of the Digital Communication Scale (DCS) and three open-ended questions. The DCS was initially created and examined in Finland, after which exploratory and confirmatory factor analyses were conducted, allowing the relevant factorial structure of DCS to be extracted. A Structural Equation Modelling (SEM) was specified to associate characteristics of Chinese parents (n = 537) and teachers (n = 149) and the extracted factors. Following the open-ended questions, the qualitative data were coded using inductive coding.

Findings

A four-factor structure of DC elucidated parents' and teachers' views on their involvement, partnership, sufficiency of information, and feedback. Parents' and teachers' views of DC were overall congruent in their partnerships and positive attitudes towards DC. Gender and attitudes towards the usage of DC were found to be associated with involvement affect respondents' experience of using DC significantly. The responses to the open-ended questions revealed that both parents and teachers saw DC as a valuable tool for receiving and providing study-related matters.

Keywords: parent-teacher partnership, digital communication, involvement

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Table of Contents

Abstract 4

Acknowledgement 6

Table of Contents 7

List of Tables 11

List of Figures 12

Chapter 1 Introduction 13

1.1 Communication in Parent-Teacher Partnerships (PTPs) 13

1.2 Digital Communication in Chinese Education System 15

1.3 The Present Study 17

Chapter 2 Theoretical and empirical framework 20

2.1 Parent-Teacher Partnerships (PTPs): Why Are They So Important? 21

2.1.1 Involvement and Partnership 21

2.1.2 Quality of Parent-Teacher Partnerships (PTPs) 24

2.1.3 Parent-teacher partnerships in China 28

2.2 Role of Communication in Parent-teacher Partnerships (PTPs) 30

2.2.1 Shared Perspectives and Communication 31

2.2.2 Avenues of Communication 33

2.3 Parent-teacher Communication through Technology 35

2.3.1. Quantity and Quality of Digital Communication (DC) 36

2.3.2 Technology and Digital-enhanced PTPs in China 38

2.4 Gaps in The Literature 41

2.5 The Present Study 42

2.6 Theoretical Model *43*

Chapter 3 Methodology 46

3.1 Rationale *46*

3.2 Sampling and Procedures *47*

3.2.1 Access and Recruitment 47

3.2.2 Participants 49

3.3 Data Collection *50*

3.4.1. Quantitative Data Collection: Digital Communication Scale 50

3.4.2 Pilot Survey 52

3.4.3 Qualitative Data Collection 54

3.4 Data Analysis Strategies *55*

3.4.1 Research Question 1 – Exploratory Factor Analysis & Confirmatory Factor Analysis (CFA) 55

3.4.2 Research Question 2 – Structural Equation Model 58

3.4.3 Research Question 3 – Content Analysis 60

3.5 Ethics *62*

Chapter 4 Results 63

4.1 Quantitative findings: Research Question 1 ..... *63*

4.1.1 Exploratory Factor Analysis: One-factor structure 64

4.1.2 Exploratory Factor Analysis: Three-factor structure 64

4.1.3 Exploratory Factor Analysis: Four-factor structure 65

4.1.4 Confirmatory Factor Analysis 68

4.2 Quantitative findings: Research Question 2 ..... *72*

4.3 Qualitative findings: Research Question 3 ..... *75*

4.3.1 Context Analysis 75

Chapter 5 Discussion 79

5.1 Restatement of Research Questions *79*

5.2 Discussion of Findings *81*

5.2.1 The Four-factor Structure of the Digital Communication Scale 81

5.2.2 Respondents Differ in Their Views on Digital Communication 85

5.2.3 The Views of Parents and Teachers Concerning the Contents of DC 88

5.3 Overall Evaluation of the Research *90*

5.3.1 Significance of the Research 90

5.3.2 Limitations of the Research 91

5.4 Practical Implications and Future Research *92*

5.4.1 Development of Partnership Strategies Based on DC Patterns 93

5.4.2 Provision of Scaffolding for Positive Attitudes and Shared Views 94

5.4.3 Suggestions for Future Research 95

5.5 Conclusion *96*

References 98

Appendix A: Information Sheet (Chinese version and English version) 121

Appendix B: Invitation Letter for Gatekeepers 123

Appendix C: Consent Form for Teachers (Chinese version and English version) 125

Appendix D: The CUREC Ethical Approval Notification 128

Appendix E: First Page of The Online Survey - Informed Consent (Chinese version and English version) 129

Appendix F: Participants' attitudes towards DC 131

Appendix G: Rotated factor structure of the DCS for separate parents' and teachers' dataset 132

List of Tables

Table 1 Characteristics of the parent and teacher participants 50

Table 2 The Digital Communication Scale (DCS).....51

Table 3 Rotated factor structure of the common items of DCS from the merged dataset.....66

Table 4 Correlations of the extracted factors of DCS 68

Table 5 Mean scores, standard deviation, skewness, and kurtosis of the extracted four factors...69

Table 6 Goodness-of-fit statistics for all models 72

Table 7 Covariate effects of participant type, gender, attitude, and location on extracted factors of DCS.....74

Table 8 The contents parents and teachers wish to communicate digitally.....75

List of Figures

Figure 1 Epstein's Theoretical model overlapping spheres of influence, 1989. 24

Figure 2 The Conceptual Framework of the Study.....44

Figure 3 Flow chart of the sampling procedure.....49

Figure 4 Model 1: One-factor structure for DCS.....70

Figure 5 Model 2: Three-factor structure for DCS 71

Figure 6 Model 3: Four-factor structure for DCS.....71

Figure 7 The SEM of 4-construct model.....74

Chapter 1 Introduction

1.1 Communication in Parent-Teacher Partnerships (PTPs)

Collaborative involvement between teachers and parents in establishing educational partnerships is well-known to positively affect children's academic achievements and overall developments (Sheldon & Epstein, 2005; Jerome, 2006; Kilgore, 2010) and, hence, a suggested area for teachers' professional development (Shartrand et al., 1997). What defines the parent-teacher partnership (PTP) is congruent perspectives between schools and families, where their power and responsibilities are evenly distributed (Lareau, 1996). The terms teacher-parent collaborations, home-school partnerships, family-school engagement, educational partnerships, and parent-teacher relationships will also be used interchangeably with PTPs.

Epstein's (1987) theory of overlapping spheres of influence defines six spheres of the PTP: *parenting*, *communicating*, *volunteering*, *learning at home*, *decision-making* and *collaborating*. Later, empirical evidence for Epstein's (1987) theory has been provided by a small-scale study (Palts & Kalmus, 2015), interviewing 44 teachers and 39 parents in six Estonian schools. The results suggested that the educational partnership between partners becomes more efficient when the range of overlapping spheres of influence are as significant as possible; however, this was from a small sample size and may not generalise internationally. At the centre of the theory is communication, the mediator of spheres (Bouffard, 2006). It is claimed that "perfect" communication requires elements of *clarity*, *readability*, *frequency*, *quality*, *effectivity*, and *informativity* (Epstein & Sanders, 2009), creating the prerequisites for establishing well-functioning partnering relationships between families and schools.

Studies into the quality of communication between families and schools associate the contents of such two-way communication with playing a role in building and maintaining a PTP. One of the key contents of two-way communication is providing encouraging feedback, examined through class notes with eleven predetermined feedback choices from 703 Finnish teachers (Oinas et al., 2018). The study found that different feedback was given among Finland students, especially when negative feedback was provided. Hilbig (2009) stated that that negative feedback had more substantial effects than positive information in PTPs. Consequentially, the positive parent-teacher digital communication may be jeopardised by negative feedback from teachers (Mautone et al., 2011).

Recently, a specially designed 14-item Digital Communication Scale (DCS) was developed by Kuusimäki et al. (2019) in the research article *Parents' and Teachers' Views on Digital Communication in Finland:* to assess whether good two-way digital communication is a critical aspect in establishing and maintaining parent-teacher relationships. The study aimed to elicit the Finnish parents' (n = 1123) and teachers' (n = 118) views on their partnerships, feedback, and clarity of messaging through digital communication. Parents and teachers were satisfied with the communication, which they saw as helping strengthen the PTP and deliver meaningful information on their children's progress. In general, Kuusimäki et al. (2019) claim that the positive attitudes of parents and teachers about digital communication (DC) facilitate good PTPs, consistent with Epstein and Saunder's (2009) findings. However, by comparing the parents' and teachers' views on the technologically enhanced feedback independently, a perspective gap between Finnish parents and teachers was made apparent. Parents said they got less encouraging feedback about

their children than the educators anticipated, and teachers in DC were confronted with greater uncertainty than parents.

1.2 Digital Communication in Chinese Education System

Parent-teacher connection through digital platforms establishes a foundation for mutual respect and a willingness to work toward common goals (Kuusimäki et al., 2019); however, little research has been conducted in China. One reason for the lack of research may be the polarised parents' and teachers' perspectives on parental involvement, and their partnerships (Dong et al., 2020). While many existing Chinese education policies emphasise improving parental attitudes and implementing parental influence in education, there has been little research on how digital communication empowers parents to advance their partnership with teachers.

An important consideration, highlighted in several studies, is that increasing parent-teacher partnerships (PTPs) must consider the communicational barriers when sharing information between families and schools online, instead of traditional ways (Grolnick & Slowiaczek, 1994; Palts & Kalmus, 2015). For instance, Willis and Exley (2018) found that functions in DC tools like emoticons and short-predictable responses oversimplified the contents and impeded detailed knowledge exchange between parents and teachers. Dong et al. (2020) revealed that many Chinese parents preferred to meet with teachers face-to-face without misunderstandings in digital channels. Many parents negatively perceived digital interactions, reasoning with "inconvenient, challenging, and time-consuming" experiences (p. 6). This study is based on Epstein's (2011) assertion that communication between partners becomes less efficient when communication channel preferences overlap only slightly, resulting in jointly influence that hinder students' academic and social growth.

Information and communication technology (ICT) has permitted various innovative parent-teacher collaboration approaches during the last few decades. The rapid ICT development integrates diverse teaching methods and accelerates educational reform influences the Chinese educational system. In terms of utilising electronic tools and platforms to facilitate two-way communication, digital technology invites teachers and parents to provide and receive real-time feedback (Palts & Kalmus, 2015), and is now capable of real-time chatting by clicking on predefined options (Huang et al., 2020).

In China, 90% of students are now enrolled in schools with technology-based communication platforms (OECD, 2020). The newest *2035 China's Education Modernization,* issued by the Chinese Ministry of Education (MOE) (2019), highlights the necessity of improving the parent-school cooperation mechanism using digital technologies. This national plan sets the direction for speeding up educational reform in the information era in China, and shows that technologies for parent-teacher collaboration and communication attach more and more attention in China; and the importance of understanding the effectiveness of digital communications among their users - parents and teachers.

During the COVID-19 pandemic, the MOE has quickly created initiatives and guidelines on home-based learning - through online platforms during school closures (MOE, 2020a; MOE, 2020b). A descriptive qualitative study showed that the online educational partnership forces teachers to monitor students' learning relative to time and demands parents' supervision at-home learning and management during COVID-19 (Bhamani et al., 2020). It is a crucial concern that Chinese parents' engagement has such negative ramifications, due to its potential for increasing

control and diminishing autonomy support (Cheung & Pomerantz, 2011, p. 4). Consequently, there has been pressure on both parents and teachers to negotiate an effective two-way communication of receiving and providing a comprehensive evaluation of children's achievements (Cheung & Pomerantz, 2011).

Many communicational problems arise in online communication. Negative and uneven feedback to students, for instance, has become a problem in education practices. Meanwhile, the rapid growth of information technology influences the Chinese educational system despite a lack of research or evidence base. Many national policies have been established to accelerate an effective academic relationship using ICT and digital communications, especially during the outbreak of the COVID-19 in China. Therefore, it is crucial to understand whether those political decisions influence parents' involvement and teachers' approaches to families. More importantly, the dimensions and significance of parent-school partnerships established through DC require more investigation in China.

1.3 The Present Study

In the present study, I investigate digital communication (DC) among parents and teachers in two cities in China. The present study will assess both Chinese parents' and teachers' views of the partnership within the same DC practices with the digital communication scale (DCS). This DCS integrated the previous studies and previous Kuusimäki and her colleagues' (2019) extensive experiences with parent-teacher partnerships (PTPs) and parent-teacher communication. The DCS contains 22 items that reflect respondents' views on DC, corresponding to three communication dimensions in the overlapping spheres of influence theory. In this study, all of the items in DCS will be translated from the original language, Finnish to Chinese. This study seeks to measure DC

in China compared to the original study conducted in Finland, and establish how Chinese parents and teachers have experienced this communication.

Previously, Kuusimäki et al. (2019) found a three-factor structure, each factor with an adequate internal consistency of the DCS with parents and teachers from two municipalities in Finland. In order to answer the quantitative research questions, the factor structures of the DCS will be explored and confirmed with a Chinese sample. The present study will examine if the DCS is a robust scale with the Chinese-cultural context, and serves as a reliable instrument for analysing parents' and teachers' views of DC. Within the DCS, this study aims to extract the common factors between Chinese parents' and teachers' views of DC in domains of DCS, and if those common factors differ from the previous Finnish study. This study also aims to investigate some characteristics of participants, such as locations and genders, which are variables for predicting the difference in participants' views of DC. In addition to DCS, the questionnaire will contain open-ended, qualitative questions: to understand the contents of DC for the PTP. The aim of collecting the qualitative data is to analyse the preferences of Chinese public-school teachers and parents regarding the contents of the DC and their attitudes towards DC connected therewith.

The dissertation contains five chapters, The next chapter, Chapter 2, will draw on previous literature and existing research to explore the PTP and DC further. The chapter ends with a theoretical model for my study. In Chapter 3, samples and procedures, instruments, and analytic procedures are outlined. Descriptions of the methods of the analyses employed to address the research questions will be explained. After that, the results chapter will outline the key findings.

Finally, the findings concerning previous literature and the implications, strengths, and limitations for further research will be discussed in Chapter 5.

Chapter 2 Theoretical and empirical framework

This chapter will review the literature regarding parent-teacher partnerships (PTPs) and digital communication (DC). Firstly, the theoretical framework that illustrates the role of parent involvement and its relationship with a PTP will be summarised. Previous literature has recognised the intrafamilial and extrafamilial factors that may influence parent involvement in educational practices, resulting in fewer parental initiatives or motivations for establishing partnerships with their child's teachers. It is worth recognising that teachers' attitudes and practical approaches also play essential roles in working with parents during initial teacher preparation and positively impact parent-teacher partnerships (OECD, 2009; Leithwood, 2009). However, only some small-scale studies have investigated teachers' views on their accountability for initiating and maintaining a PTP; both policy frameworks and research literature have mainly focused on the responsibilities and views of parents (Mandarakas, 2014).

Secondly, literature that has explored the ways of communication and its qualities will be presented. Two-way communication is at the heart of the overlapping spheres of influence theory (Epstein, 1989) and paves the way for overall partnerships. Therefore, as the new form of communication practice, DC still holds elements of *clarity, readability, frequency, quality, effectivity, and informativity* for successful two-way communication (Epstein & Sanders, 2009). Thirdly, several studies show that DC facilitate partnership-building in various cultural contexts. In order to understand the PTP of Chinese parents and teachers in digital communication channels, the following will be reviewed: the legislation of parent-teacher partnership frameworks, the background of Chinese digital competence, culture aspects, and views of DC and its contents in

the current education system. Finally, gaps in the current literature will be identified, the necessity of the present study and research questions will be proposed at the end of this chapter.

2.1 Parent-Teacher Partnerships (PTPs): Why Are They So Important?

The PTP has long been considered a priority in educational legislated frameworks in many countries, and has been widely found to impact students' academic achievements and overall development positively (e.g., Epstein, 2010). However, the perceptions of parents and teachers are usually considered separately in most studies and policies (Minke et al., 2014). For instance, parental involvement in children's education (Hoover-dempsey & Sandler, 2015) and their positive attitudes (Dauber & Epstein, 1989) towards family-school collaborations would positively correlate with the PTP. However, the relationships of parents and teachers are dynamic in that they can be affected by the administrative and professional approaches of a school and the various features of a family. Therefore, Epstein's (1989) theory of overlapping spheres of influence highlighted the shared power and responsibilities in PTPs. The legislated frameworks and their effectiveness in China to empower parents and facilitate the PTP will be explored and critiqued.

2.1.1 Involvement and Partnership

PTPs are different from, but connected to, the concept of parental involvement in education (Minke et al., 2014). An extensive literature on parental involvement provides the potential to affect students' academic achievements and overall well-being (Alton-Lee, 2003; Epstein, 2010; Pomerantz & Moorman, 2010). Its cognitive consequences on children's numeracy and literacy achievements were addressed by Van Voorhis (2013); and also, by Daniel et al. (2016), as well as its consequences on children's social development (Ceballo et al., 2010). However, parents'

involvement is not always positive; their maths anxieties can be passed to students, negatively impacting students' numeracy cognitions (Dowker, 2021).

Many researchers have discovered predictors of parental involvement and ways to improve it. Generally, it appears that parental involvement can be predicted by multiple variables, such as SES, age, gender, and race (Sylva et al., 2004; Mansour & Martin, 2009; Ceballo et al., 2010; Harris & Chrispeels 2006). Most studies in China focused on the parents' psychological views, socioeconomic status, and family-cultured habitus (Chen, 2012; Jin, 2019; Sheng, 2019) rather than schools' involvement strategies of collaborating parents and educators. A slim body of research primarily emphasised the implications of the parent-teacher relationship regarding school administrations (Kumar, O'Malley & Johnston, 2014).

Moreover, parental involvement also exists at multidimensional levels where intrafamilial factors (e.g., participation in schools and at-home activities visible to teachers) and extrafamilial factors (e.g., human capitals that have long-term influences on children's development) modulate parents' conceptions of involvement (Grolnick et al., 1997). The authors confirmed Epstein's (2010) framework of significant institutional interactions to influence parents' cognitive and personal involvement, including attending conferences and volunteering at schools. Some studies also touched on the teachers' attitudes on parent involvement behaviours (Grolnick et al., 1997; Fantuzzo, Tighe, & Childs, 2000). For example, when teachers are active users of involvement practices, parents in more optimal contexts become more active at assisting their children's long-term educational development (Grolnick et al., 1997). Wong and Hughes (2006) highlighted that those involvement factors at multidimensional levels lead to family-school collaborations for

partnerships, inviting teachers and parents to share their perceptions and establish a balanced power relationship. However, it is still more typical for teachers to develop only low commitments in empowering parents' roles in some contexts. Consequently, parents who experienced inadequate decision-making opportunities and received low quality of resources would be less optimistic about their abilities to engage in their children's education (Ames, 1993; Epstein, 1991; Gronlnick & Slowiaczek, 1999).

Epstein (1989) argued that many studies polarised the evaluation of PTPs as a whole, where educators and parents jointly lead school and family organisations. Unlike previous studies, an involvement strategy requires a fundamental redistribution of power between parents and teachers (Sanders & Hembrick-Roberts, 2013). The viewpoint emphasised that parental involvement did not solely depend on the nature of the family nor the engagement practices of the school. According to the internal structure of Epstein's (1989) theoretical model (Figure 1), children lie in the centre of the model (indicated by "C" at the centre of Figure 1), since they are considered as the main actors in education (Epstein, 2010). Thus, a clear division of labour is impracticable in this model, since instructors and parents rely on one another to complete the task of education (Bryk & Schneider, 2002). In Figure 1, the arrows indicated the inter-institutional interactions within the overlapping area.

Figure 1 Epstein's Theoretical model overlapping spheres of influence, 1989.



According to Epstein and Sanders (2009) and Epstein (1989), a major strength of the theory of overlapping spheres of influence recognises the shared power in decision-making and distributed responsibilities, altering partnerships between school staff and students' families. Indeed, such mutual involvement often has strongly influenced parents' decisions to become involved (Green et al., 2007). Once the specialised roles of parents and teachers in the upbringing and education of children become reciprocal, joint outcomes can be achieved through shared perspectives in family-school engagement (Jeynes, 2011). Therefore, the quality of the PTP appears to be a critical factor in engaging both schools and families in the discussion of children's growth and development, which lay at the centre of their connections (Clarke et al., 2009)

2.1.2 Quality of Parent-Teacher Partnerships (PTPs)

The study of interactive partnerships between families and schools has become a research focus. By definition, a parent-teacher partnership (PTP) 'implies a relationship between equals

where power and control are evenly distributed' (Lareau, 1996, p.35). Indeed, many studies emphasised the even power in coordination, cooperation, and complementarity between schools and families as drivers of involvement and a catalyst of productive PTPs (Grolnick et al., 1997; Desimone, 1999; Kohl et al., 2000; Fan & Chen, 2001). Partnerships between families and schools are always present (Pianta & Walsh, 1996); however, their quality varies as individual and institutional factors contribute and conflict dynamically (Gascoigne, 1995; Bouffard, 2006).

The quality of PTPs can be influenced by relational trust between families and schools (De Wit, 2005). For instance, the teachers' views of equal responsibilities influence their autonomy and commitment to establish and maintain a partnership with the child's parents. Among the first and most famous studies that have examined trustful relationships was Becker and Epstein's (1982) survey of teachers' respect and personal regards in Maryland. The study found that teachers had low personal regard for frequent connectedness, as they became involved when issues with the child had arisen. In contrast, parents tended to get in touch when things were going well, challenging the discussion of common goals and the desired parenting activities to be initiated and organised. The accountability of parents' abilities also threatened the relational trust between families and schools. The study found that around half of the participating teachers had doubts about the practical outcomes of getting parents involved in learning activities (Becker & Epstein, 1982). As a result of teachers under-considering parental engagement concerning the initiation of involvement activities, only a minority of teachers went beyond the standard interaction patterns and took the initiative to communicate.

Views of mutual partnership appear to influence teachers' beliefs about the connectedness with parents. In Hoover-Dempsey et al.'s (1987) study, elementary-school teachers emphasised behaviours they can observe. In contrast, many invisible parenting behaviours would lead to productive parental involvement in immediate ways. The finding was that "teacher perception of parent support" was the variable most consistently linked to all parental involvement outcomes, albeit indirect, for the impacts on "role clarity and complementarity in developing productive home-school relationships" (p.431). This result may explain the conclusion of Wong and Hughes (2006), who stated that parents' and teachers' perceptions of effective parental involvement often differ. Wong and Hughes (2006) also highlighted the teachers' efficacy and perceptions of organisational rigidity in influencing the quality of PTPs, including parents' openness to participating teachers' pedagogical actions and parents' willingness to discuss or share their opinions.

Positive PTPs are characterised by parents' believes in promoting positive child adaptation (Clarke et al., 2009). Parents' psychological motivation (Hoover-Dempsey et al., 2005; Green et al., 2007), individual expectation (Zhong, 2017), and social networks (Fan & Chen, 2001; Sheldon, 2002) all appear to influence their beliefs about functioning PTPs. Parents who do not see themselves sharing the educational role in regular pedagogical practices will be less engaged and influenced by teachers' attitudes and behaviours. Thus, it is essential to understand how perceptions of PTPs may play a role in parents' perceptions of students. Barriers to positive PTPs have existed when parents' values and attitudes conflict with teaching practices (Grolnick & Slowiaczek, 1994).

Furthermore, these partnerships are characterised by parent-teacher role complementarity, consistency, and continuity across spheres. As teachers' efficacy and clarity of role conceptualisation improve, it appears likely that some areas of ambiguity and overlap between parent and teacher duties will disappear (Lightfoot, 1978; Lightfoot, 1981). Suppose a school was stratified, building a quality collaboration has been identified as problematic due to the deficiency of parents' abilities and power, and instructors in these schools report fewer parent connections (Corwin & Wagenaar, 1976). Studies have found that the quality of PTP was threatened by families of lower SES (Mansour & Martin, 2009), teachers' different expectations and beliefs between genders (Sylve et al., 2004; Ceballo et al., 2010), and within ethnic minorities (Ceballo et al., 2010; Harris & Chrispeels 2006). In order to build good home-school connections, Hoover-Dempsey et al. (1987) highlighted the necessity to explain and complement the shared duties between schools and families. Through these mechanisms and processes, PTPs provide a basis for students' academic achievement, because decision-making and assessments of the PTP are done by considering the perspective of either parent or teacher.

Regarding socioeconomic background or ethnicity (Auerbach, 1989), the key to developing effective PTPs still lies in empowering parents' roles. Teachers and parents may engage and communicate effectively to establish complementary duties (Epstein, 1991; Munn, 1993). For example, focusing on solely negative behaviours also strains the parent-teacher relationship (Semke et al., 2012). It is well acknowledged that parents and teachers shared responsibility, while reciprocal involvement serves as the foundation for collaborative partnerships (Fantazzo et al., 2004). It is also important to understand how the same parent-teacher relationships may have overlapping influences from the parent-teacher dyad. In summary, the key components of DC are

trustful and mutual partnerships between parents and teachers, positive believes towards promoting children's developments, and the complement and consistent collaborations between families and schools.

2.1.3 Parent-teacher partnerships in China

Parent-teacher partnerships (PTPs) are regarded as essential at the national level in China (Deng et al., 2017), and all educational institutions are required to instruct in this area (Wen, 2010). China appears to have a high-level recognition of the 'roles of parents' in terms of the PTP, family education and engaging attitudes in various policy decisions and frameworks. In China, the PTP has attracted more and more attention from the Central Communist Party Committee (CPC) and the Ministry of Education (MOE) (MOE, 2012; MOE, 2015). It has been recognised that schools and families are the two legal responsibility subjects for their children's education. Building a harmonious relationship between family and school, and forming a fundamental guarantee for children's development are the two main concepts of national education policies in China since 2004. As expressed in the policy document *Basic Behaviour Norms of Parents' Family Education* (ACWF, 2004), the coordinative role of school in home-school collaboration was clarified: schools are encouraged to invite parents to participate in the process of decision-making.

Furthermore, a variety of home-school activities have been established by committees between schools and parents to exercise the *Outline of the National Medium- and Long-Term Programme for Education Reform and Development 2010-2020* (CPG, 2010). The document recommends a strengthened communication and cooperation on home-schooling: to facilitate children's and adolescents' growth. To reiterate the importance of PTPs, the ACWF, MOE of PRC

and Civilization Office of the Central Communist Party Committee (CCPC) jointly issued *guidance on further strengthening the work of parent-school partnership* (Xue & Li, 2019). The guidance urges the requirements for guiding ideologies, organisation, and management; and takes measurements of both parents' and teachers' responsibilities in school management.

School and homes were two separate worlds for children; however, if there were consistent support from parents and instructors, pupils were more likely to benefit from the continuous caring environment between schools and homes (Harris & Goodall, 2009). Therefore, it is essential to investigate the link between PTPs and children's developmental outcomes in Mainland China and parent-teacher collaboration across the country: to give evidence-based approaches. As a result, these Chinese official frameworks and guidance relating to PTPs appear to be built on a clear understanding of educational roles, rather than offering specific initiatives on building cooperative roles and responsibilities.

In line with the previous studies in the Western countries, many teachers have reported having doubts about interactions with parents; simultaneously, parents have reported feeling their expertise are unrecognised and unprepared for their educational cooperation abilities (Cheatham & Ostrosky, 2011). This trust crisis and unequal role positioning often lead to miscommunication and obstacles to building and maintaining a PTP (Minke & Anderson, 2003). From the report on *Family Education Guidance in Shandong Province* (SPED, 2019), approximately 35,000 parents and 2,000 teachers felt that the cooperation between parents and teachers emphasised more on administration than the opportunities for the actual participating practices. The report also found that teachers emphasise behaviours that they can witness, whereas parents also assist their children

in ways that are not immediately visible to teachers. The power imbalance in the PTP could cause a less harmonious relationship, and conflicts could arise by, for example, information asymmetry between families and schools. Furthermore, the report highlighted that those Chinese teachers have a high expectation for parents; but lack relevant communication and personal guidance, leading to unproductive working partnerships with parents in assisting child's education (Lawson, 2003). The salutary effect of PTPs for school students' developmental outcomes has almost only been documented in Western societies; empirical studies in the results of implications of parent-teacher guidance and policies leave the context of China is sparse.

2.2 Role of Communication in Parent-teacher Partnerships (PTPs)

Section 2.1.3 highlights the necessity to investigate whether collaborative perceptions of the partnership impact behaviour instead of individual views. Such collaborations facilitate by successful communication features, which are critical for encouraging parental and teacher involvement (Bakker et al., 2007), and sustaining a consistent and continuous exchange of knowledge between school and home life to foster positive child adaptation (Oostdam, 2009; Clarke et al., 2009). Nevertheless, there is a fair range of communication opportunities and avenues available to parents and teachers where they can share information and views regarding their collaborative partnership. Therefore, measuring the features and avenues of communication may provide depth of understanding in how parent-teacher partnerships (PTPs) function. The following section will detail the theoretical framework behind effective communication and evidence of its importance as the foundation of educational partnerships between families and schools.

2.2.1 Shared Perspectives and Communication

Epstein and her colleagues introduced an integrated *Framework of Six Types of Involvement* (Epstein, 2010). The framework outlines a comprehensive model of PTPs that includes several components, such as developing a school-based action team, creating and implementing action plans outlining partnership strategies and programmes, most importantly, the communications. The previous literature has advanced the partnership approach to care for the children they "share" (Adams & Christenson, 2000). The benefits accrue to children when the positive overlap between home and school occurs, generally including shared decision-making and perspectives from family and school that create consistent, caring environments across families and schools (Blank et al., 2003; Dryfoos et al., 2005). In both levels of social relationships, teachers' positive attitudes and school climate (Maxwell et al., 2017), empower parents (Griffith, 1998), and a variety of communication tools (Deplanty et al. 2007) facilitate communication strategies and connectedness between parents and teachers (Griffith, 1998).

Epstein (1986) suggested that communication is important, and there may be value in influencing parents' recognitions and trust in teachers' interpersonal abilities and professional qualities. Dauber and Epstein (1989) confirmed that the sufficient information of school programmes and activities shared with parents was one of the primary measures of the effectiveness of parent involvement practices. Although individual perceptions are significant and likely to guide individual parent and teacher involvement, Epstein (2010) suggested that the expected outcomes for partnerships also include novel communicational approaches such as greater understanding of families and other linkages between families and schools. One of the few studies assessed how shared perceptions from parents and teachers relate to children's attendance

– specifically finding that regular communication with families was especially beneficial for average daily attendance rates and reductions in the chronic absence (Epstein & Sheldon, 2002).

Indeed, effective communication is a key distinguishing feature of partnerships strategies, where partners' different priorities and perspectives can be determined, and shared decision-making is distributed (Dryfoos et al., 2005; Valli et al., 2013) in the same way that parents' awareness of school practices and capabilities influence their involvement choices (Epstein & Sheldon, 2002). Together, these findings suggest that multiple modes and pathways of communication enhance connections (or "overlap") between families and schools, and that these connections help to improve student attendance (Epstein & Sheldon, 2002). Two-way communications are different from a fundamental redistribution of power (Sanders & Hembrick-Roberts, 2013), which would benefit from frequent interactions between schools and families. Children in the centre are more likely to receive joint support and responsibilities and develop social relationships. Unfortunately, barriers to conduct effective communication exist in real-world communication practices. Schools and families are unavoidably conflicting due to the function of these two entities and their inherent differences in interactions with the children (Lightfoot, 1978). It is more likely that the school controls educational perspectives, while parents' expertise was largely unrecognised (Cheatham & Ostrosky, 2011; Epstein & Sanders, 2009).

In Vosler-Hunter's view of PTPs, shared understanding and goals are at the forefront. Parents and instructors "have common obligations and rights, are recognised as equals, and can jointly participate in the process" in a collaborative relationship (Vosler-Hunter, 1989, p. 15). If shared perceptions of parents and teachers influence their PTPs, it is critical to understand communication

characteristics that predict this shared perception. Regarding the role of communication in building PTPs, the quality of the communication has been found to be a better predictor than the frequency of communication (Fantuzzo et al. 2004; Hoover-Dempsey et al. 2005). The qualities of perfect communication were lined in Epstein and Sander's framework (2009): *clarity*, *readability*, *frequency*, *quality*, *effectivity*, and *informativity*. These elements provided a framework for Kuusimaki et al. (2019) research on parents' and teachers' views of digital communication in Finland. Kuusimaki et al. (2019) developed a new measuring instrument, the Digital Communication Scale (DCS): to examine digital communication qualities. Their study also proved to have reliable psychometric properties, such as *partnership*, *encouraging feedback*, and *unclear communication*, to investigate the views of parents and teachers in their partnership in digital communication.

2.2.2 Avenues of Communication

Caspe (2003) proposes that teacher preparation and professional development programmes should actively support teachers' communication skills, because school communication practices are essential in incorporating families in the educational process. Many teachers employed various communicational avenues to ensure that their students' parents were involved in one-way or two-way exchanges (Berger, 1991). The openness and flexibility of the communication avenues are essential factors of building and maintaining a PTP (Oostdam & Hooge, 2013).

One-way communication only occurs when teachers seek to inform parents, and the social roles of parents and teachers are often solidly constructed. Teachers and parents tend to follow their respective positions in these traditional forms of one-way communication, where teachers act

as guidance recipients and parents as instructions seekers (Cheatham & Ostrosky, 2011; Leenders et al., 2018). Some parents felt powerless in one-way communication since their involvement was more on serving than on involvement (Stefanski et al., 2016). As a result, the unequal status of parents and teachers often leads to problems in building mutual trust. Schools, thus, only focus on providing accurate information and establishing clear structures do not enter into any form of educational partnership (De Vries, 2007).

In order to communicate effectively with parents, schools' attention has shifted towards two-way communication that involves interactive dialogue between teachers and parents. Research shows that parents enjoy participating in conversations about pedagogical parenting issues (Menheere & Hooge, 2010). These interactive two-way communications also included informal conversations and unscheduled visits (Turnbull et al., 2011), where teachers and parents can discuss and learn more about each other's perspectives (Denessen et al., 2007).

Two-way communication provides teachers and parents with equal status and a platform for mutuality of concern (Vosler-Hunter, 1989; Lawrence-Lightfoot, 2004). Two-way communication also allows teachers and parents to provide and receive feedback, improving the efficiency of educational practices and stimulate a caring pedagogical climate (Oostdam & Hooge, 2013). Teachers are encouraged when they know that parents are supportive and involved in their children's education (Willemse et al., 2018). Furthermore, this collaboration can help parents become more committed to their responsibilities in the home-learning environment (Hoover-Dempsey & Sandler, 1995; Smit et al., 2006). In an international study,

More recently, Leenders et al. (2018, 2019) carried out two separate studies with parents and teachers in different school types to examine whether teachers used two-way communication. Two-way communication has been valued highly by parents (Leenders et al., 2018) because these parents can see themselves as co-educators and equal to teachers (Turnbull et al., 2011). Furthermore, semi-structured in-depth interviews with teachers indicated that teachers generally showed the best understanding and attitude when facing complex discussion issues (Leenders et al., 2019). However, the authors concluded that mainstream teachers still tended to give advice as professionals regarding socio-emotional development and educational questions. Nevertheless, interviews with the children's parents showed the need for more discussions and conversations to align children's development, rather than exemplified by informing, explaining, and convincing dialogues (Leander et al., 2019, p. 525).

2.3 Parent-teacher Communication through Technology

This study aims to identify to what extent are both parents and teachers developing the shared responsibilities and perspectives of a partnership through their digital communication (DC). The fast development of information technology allows overlapping spheres of influence to interact through various channels. These new technologies for home-school communication provide a series of opportunities for teachers to communicate with parents, promote parents' attention to children's academic works, and ultimately encourage and assist parents and teachers to work together. However, many challenges arose when teachers provided a high quantity and multimodal information through electronic platforms (Willis & Exley, 2018). As for Chinese parents, traditional cultural threads, dispositions, and attitudes toward digital communication technologies have a greater influence on their perspectives of DC. By reviewing several

international studies, this chapter discusses the challenges of parent-teacher partnership through DC, including parents' and teachers' digital competence, attitudes, and expectations of the contents of the DC.

2.3.1. Quantity and Quality of Digital Communication (DC)

Educators have experimented with numerous technologies to interact with parents in innovative and time-efficient ways (Graham-Clay, 2005). In recent years, family-school communication has shifted from traditional communication avenues towards the adaption of online, digital-based communication. The rapid advancement of information technology provides more diverse means of communication, including fluent information exchange, efficient real-time conversation (Palts & Kalmus, 2015), which signals its potential for strengthening connections across all parties with schools (Tidwell & Walther, 2002; Willis & Exley, 2018).

A review of the literature found that digital communication channels have increased the "number, range, frequency, speed, efficiency, and richness" of overlapping spheres of influence (Palts & Kalmus, 2015, p.67), which enable productive PTPs (Lunts, 2003; Lewin & Luckin, 2010). Time-efficient interaction in digital channels, particularly the transparent and timeless information exchange (Thompson, 2008), has positively influenced parents' attitudes and opportunities to participate in their children's academic advancement (Bauch, 1998). For instance, parents can get direct access to teachers (Lazaros, 2016); parents value digital collaboration because it allows them to choose when and how they read and compose communications (Thompson, 2008).

Technology also can provide teachers with various communication options where they can access digital portfolios of students' performances and progress, and then share them with parents on an ongoing basis. It is one of the key features of two-way communication in parent-teacher collaboration (Swick, 2006). Tanes et al. (2011) indicated that teachers could provide direct feedback to parents about their children's learning processes and outcomes through digital channels. However, the prospects of receiving feedback vary in different cultural psychology. As De Luque and Sommer (2000) stated, parents from collectivist cultures (e.g., China) highly valued indirect and implicit group-focused feedback, instead of individual feedback. The intention of receiving group-focused feedback may also reduce the feedback being viewed negatively by Chinese parents, because such feedback tends to be targeted to a consequence of individual performance (Hattie & Timperley, 2007)

Later research proved how digital communication channels enabled rapid and effective communications between families and schools; and ample parental involvement opportunities (Olmstead, 2013). Willis and Exley (2018) found that teachers were enthusiastic about transforming from traditional parent involvement strategies - to online digital technologies. Giving the reasons for online communication enables parents' ideas to be shared, encouraging parents to cooperate with online-pedagogical practices actively. Giving social media as an example, Willis and Exley (2018) also found that it increased parental engagement by making their child's learning apparent in simple and efficient ways.

Indeed, the ability of modern technology opens up a slew of new possibilities for improving communication with parents beyond traditional formats; however, it also comes with conflicts and

communication failures. An Estonian study in primary schools highlighted different parents' and teachers' preferences of the digital channels used by schools (Palts & Kalmus, 2015). The authors stated that digital tools in school-home communication took longer to solve problematic issues, and some parents felt less comfortable with written digital interactions with teachers, due to "earlier negative experience or insufficient skills" (p.77), as noted in (Hilbig, 2009). Hence, these results generally match the opinions of Telem and Pinto (2006) and Olmstead (2013) that digital communication channels may hinder interpersonal communication and information exchange. In the State of Queensland, Australia, Willis and Exley (2018) found that the impeded knowledge exchange between parents and teachers in digital platforms, such as Seesaw, allows parents to use emoticons and oversimplified responses and expressions. Positive technology-enhanced feedback was statistically significant in favour of girls in Finland (Oinas et al., 2017). The impacts of discouraging feedback provided by teachers were magnified by DC, endangering uneven parents' motivation of passive parental involvement (Mautone et al., 2011).

2.3.2 Technology and Digital-enhanced PTPs in China

China appears to have a high level of 'education technology maturity' in terms of coverage, investment, usage, and attitudes. China has for several decades made significant progress in closing the infrastructure and access elements of its digital divide. The 2016-2020 national plan prioritised the extensive application of technologies in educational objectives (MOE, 2015). The *2018-2020 Implementation Plan for Promoting Online Poverty Alleviation* was on track to meet its 98% broadband access goal in the most impoverished areas and boost distance learning across the country (MOIIT, 2018). In 2018, over 90% of Chinese students were already enrolled in schools with a functional online learning support platform, which was much higher than the OECD

average (Schleicher, 2020). Apps, television, and other media are used to give massive open online courses (MOOCs) in China's first-tier cities (e.g., Beijing and Shanghai) and new first-tier cities (e.g., Jiangsu and Zhejiang), where teachers can also get training (Chang & Yano, 2020).

Teachers and parents who were using new technology tools to collaborate have been more passive in parent participation by utilising multimodal modes of communication (Guo et al., 2018). The authors also stated that WeChat, the most widely used social media platform in China, has promoted parent-teacher collaboration through more regular contact. WeChat tailors a network for each parent and their child, benefiting students' learning through increased access to parents' resources and expertise. The tendency in China for parents' involvement foreshadows enhanced engagement and performance, but not necessarily perceptions of competence and positive feedback from teachers. These parents' emotions align with the emphasis in Confucian philosophy on continual persistence toward self-improvement (Li, 2003); such persistence may be undermined if children receive too much positive feedback.

As an urgent response to the COVID-19 pandemic, in early February 2020, the MOE of China (2020a) mandated that all schools and universities stop face-to-face teaching and use internet platforms to deliver online learning. Through the *Disrupted Classes, Undisrupted Learnin*g initiative, which provided flexible online learning to over 270 million students, the MOE of China replied quickly and clearly (UNESCO, 2020). Unfortunately, very few investigations of how China systematically tracked the impact of its national-wise policy decision *Disrupted Classes, Undisrupted Learning* to guide schools to respond to Covid-19 by prioritising DC.

Recently, the quantitative study by Dong et al. (2020) examined parents' beliefs and attitudes about the impact of online learning on parenting and family education. The results indicated that approximately half of the parents believed that online communication has inspired their educational ideas and allowed them to collaborate into educational practices and activities during the school discourse. Although online learning has been widely promoted in China to replace traditional education during the pandemic, the study also indicated that the Chinese parents were neither trained nor ready to embrace online collaboration, resulting in negative attitudes regarding the values and benefits of online learning. The China National Institute of Education Sciences released a survey of 180,000 teachers, and found gaps in teachers' technology skills in different age groups, school types, and geographical locations. The survey's results revealed a gap between younger and older teachers in their technology capabilities, and a gap between the levels of teacher satisfaction with what they had provided (37.5%) (EdTech Hub, 2020).

Digital resources that provided rapid feedback and assessment mechanisms through teachers, although the satisfactions of technology-enhanced feedbacks in parents' view is not yet known. Unidirectional messaging, classroom management of a teacher, for example, may cause communication conflicts with children' parents, disrupting a parent-teacher relationship (Cheng & Chen, 2018). Especially when a gap in teachers' capacities in information technology occurred, elderly teachers in China were less capable of providing feedback through educational technologies (EdTech Hub, 2020). EdTech Hub's (2020) report indicated that DC for PTPs should provide a solid foundation for establishing a personalised evaluation and a trust relationship by addressing parents' requests for digital feedback. However, little research has been conducted on the specific role of DC with the available evidence from Chinese parents' and teachers' views in

building their partnerships. Considerable research has been devoted to evidence that the effectiveness of education management is changing from traditional face-to-face administration to digital leadership (Zhong, 2016). Relatively less attention has been paid to the qualities and significance of digital collaboration for the purpose of education management from parents' and teachers' perspectives (Willis & Exley, 2018).

While Chinese schools appeared to have made the best use of technology by providing continuous communication to parents through films, graphics, online guides, and support, many schools faced a new and distinct problem. Bhamani et al. (2020) argued that schools need to assess how effective teachers' outbound communication has been and if parents and students are receiving the assistance they required in the first place. EdTech Hub (2020) claimed no current evidence on how China rigorously tracked the impact of its school closure policy, or what changes were taken to encourage equal, universal access to online parent-teacher communication during this Covid-19 pandemic.

2.4 Gaps in The Literature

Two research gaps emerged during the literature review. Firstly, the link between the congruent views of partnership quality and its relation to digital involvement practices, especially communication opportunities and partnership building, has not been thoroughly scrutinised in the literature. On the one hand, existing Chinese research primarily focuses on understanding the demographic characteristics of parents and phenomena of parental involvement; however, its sufficiency and integration into PTP building have not been empirically examined. On the other hand, the key to the PTP is two-way communication, which invites both parties to establish shared

relationships and congruence perceptions of involvement (Korhonen & Lavonen, 2014; Epstein, 2010). However, no adaptation studies have investigated how two-way communications in digital channels invites Chinese parents to actively involve themselves with schools and discuss their child's needs with teachers, if any, or whether such two-way DC enables parents and teachers to establish and maintain a partnership.

The second research gap regards the literature on how parents and teachers agreed that they experienced a positive partnership, or shared perspectives through DC in China. Previous literature indicated that different difficulties and obstacles occurs from parents and teachers when using digital channels for their communication; however, there is a slim number of studies on which factors of DC correlate to the observed partnership features: parental involvement (Cheng & Chen, 2018), sufficient information flows (Thompson, 2008), give and receive technology-enhanced feedback (Palts & Kalmus, 2015). Through contextual analysing or focus group interviews, previous studies generalised opinions of parents and teachers, resulting in potentially varied communication. However, no systematic analyses of the nature and accumulation of contents have been conducted in China using any available DC platforms. The communication rules remain unclear without sufficient knowledge and open discussion (Davies et al., 1996). More information on this crucial area of partnership is needed in the Chinese cultural setting.

2.5 The Present Study

The present research aims to fill the gap left by previous studies, as discussed in the previous section. The first goal was to examine the perceptions of an existing partnership that has been identified in Epstein's collaborative types of participation. Based on prior research in Finland, the

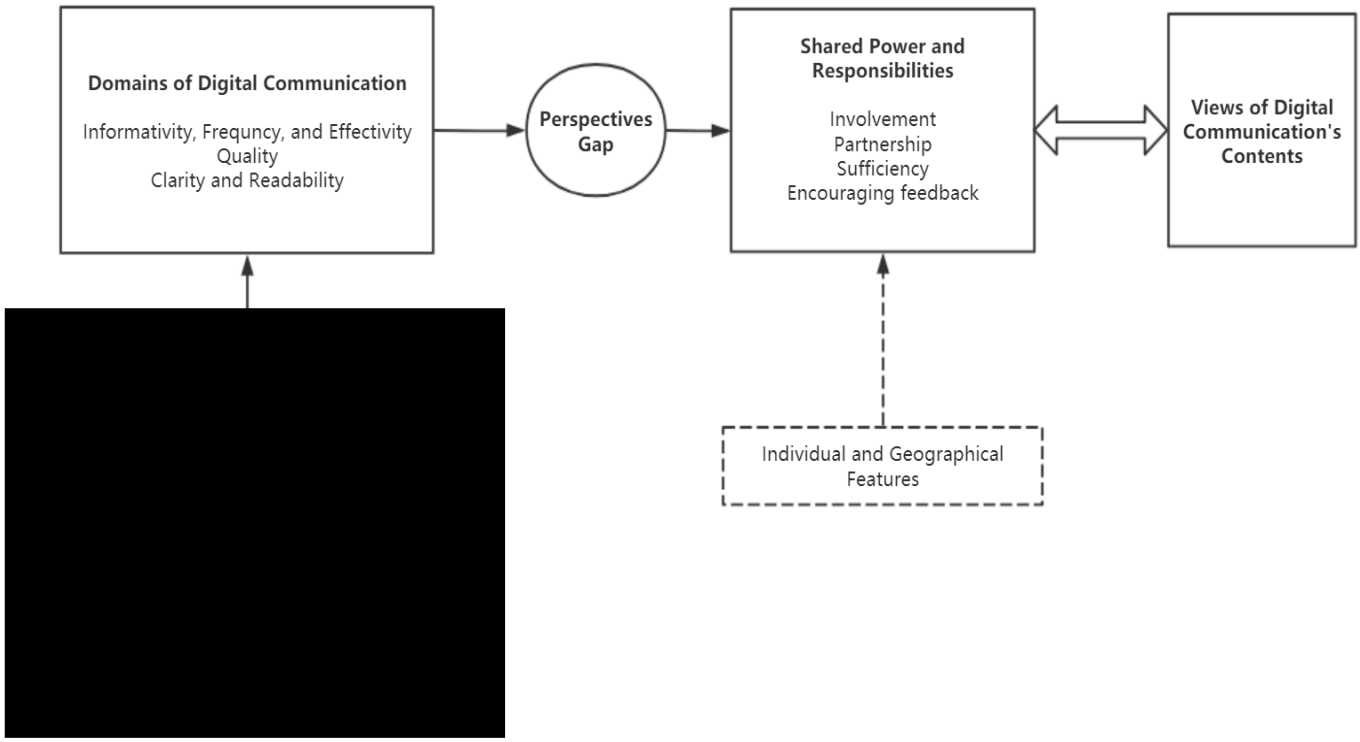
present study will assess the establishment of partnerships between Chinese parents and teachers within the same DC practices, whether it can be measured by the items of the digital communication scale (DCS). This measuring instrument investigates the parents' and teachers' views about DC in the domains of shared responsibilities and power in involvement practices, experiences of sufficient interactions, and abilities to provide and receive feedback. The present study anticipates that PTP occurs when both parents and teachers hold congruent views in a frequent, clear, and two-way communication; and are engaged in involvement practices visible to each other (Bakker et al., 2007).

Secondly, the characteristics of parents and teachers and their relations to predict their views of DC will be examined. It anticipated corresponding domains defined by digital communication various when (a) significant differences in individual and geographical characteristics of Chinese participants, and (b) Chinese parents and teachers would have inconsistent views about the contents of DC.

2.6 Theoretical Model

In order to fulfil the research purpose, a conceptual framework has been developed for this paper based on the internal-institutional interactions in Epstein's (1989) theory of overlapping spheres of influence, along with elements of communication (Epstein & Sanders, 2009). The former theory was highlighted in the previous study by Kuusimäki et al. (2019), and the latter elements provide a framework for the previous study on parents' and teachers' views of DC. The framework depicted in Figure 3 details the envisioned structure of this research project.

Figure 2 The Conceptual Framework of the Study



Starting in the lower left-hand corner, I posited the original model of Epstein (described in detail on p. 22), the overlapping spheres of interest can be conceptualised by the domains of (1) *informativity, frequency, and effectivity*, (2) *quality*, and (3) *clarity and readability* for successful two-way communication (as described in detail on p. 31). The literature on DC in the Chinese context suggests (described in detail in section 2.3.2) that a difference in parents' and teachers' views might exist. I will investigate the shared power and responsibility (described in detail in section 2.1.1) and parents' and teachers' views of DC, and the contents they wish to receive through the DC. The conceptual framework also considers the range of overlapping spheres of influence between parents and teachers through their DC, concerning the effects of individual and

geographical characteristics. Based on these conceptual frameworks, the following research questions have been proposed.

Research question 1 (RQ1): What factors emerge from the digital communication scale (DCS) among Chinese parents and teachers?

Research question 2 (RQ2): How do individual and geographical characteristics of respondents predict their views of digital communication?

Research question 3 (RQ3): Do parents and teachers differ or have the same views about the contents of digital communication?

By answering RQ1, this paper will explore and compare the Digital Communication Scale (DCS) factor models in the Chinese population. The present study adopted the DCS to examine the qualities of digital communication between parents and teachers in China. The factorial structures and analysis procedures have been intergraded based on academic findings of how Finnish parents' and teachers' well-functioning communication in digital environments support their partnership (Kuusimäki et al., 2019). Then RQ2 elucidates how respondents' individual and geographical characteristics influence the common factors of DCS in the Chinese sample. It is expected to predict respondents' experience of shared power and responsibilities through DC, characterised by their individual and geographical features. Finally, RQ3 classifies the contents of DC into predetermined categories and elucidate their relationship with parents' and teachers' views on DC. The use of qualitative data about the contents of DC will mean that this study will be able to provide a practical explanation of this phenomenon.

Chapter 3 Methodology

This chapter will outline the methodological approaches of this study. First, the rationale for the method in this study will be described. Then the study sample will be listed and summarised, including the recruitment processes and the characteristics of the participants. Next, detailed information about the instrument for quantitative data collection and open questions for qualitative data collection will be presented. Finally, the data analysis strategies and ethics of this dissertation will be reviewed.

3.1 Rationale

The data was collected using an online survey, where views of experiences of DC were measured to quantify parent-teacher partnership (PTPs) in primary and secondary schools in China. Online survey research was particularly suitable for answering the current research questions for several reasons. Despite being separated by geographic distances, the method enables contacting Chinese participants under the face-to-face contact restrictions during the Covid-19 pandemic. The qualitative measurements on the survey will help estimate the RQ1 on the factor structure of DCS. Secondly, the inclusion of open-ended questions will help address the RQ3 regarding the perspectives of DC contexts among participants. This method will overcome the shortcomings of previous survey research, which lacked explanatory power due to its dependence on quantitative data (e.g., Fryer & Vermunt, 2018). In addition, the online survey will save time and cost by moving from a paper format to an electronic survey platform.

According to the literature view, there are 904 million internet users in China, and most parent-teacher communication in China nowadays takes place on digital platforms (CNNIC, 2021),

meaning the online survey method takes advantage of a high internet access rate in China. However, online surveys in China face an additional potential impediment — The Great Firewall of China, an internet censorship project to block people from accessing specific websites outside China (Schmitz, 2020). In order to ensure the access prevented by the Great Firewall of China and effectively conduct an online survey in China, the present study used the largest Chinese online survey platform Wen Juan Xing (问卷星) (https:// www.wjx.cn) to collect data, during 1st March 2021 to 5th April 2021.

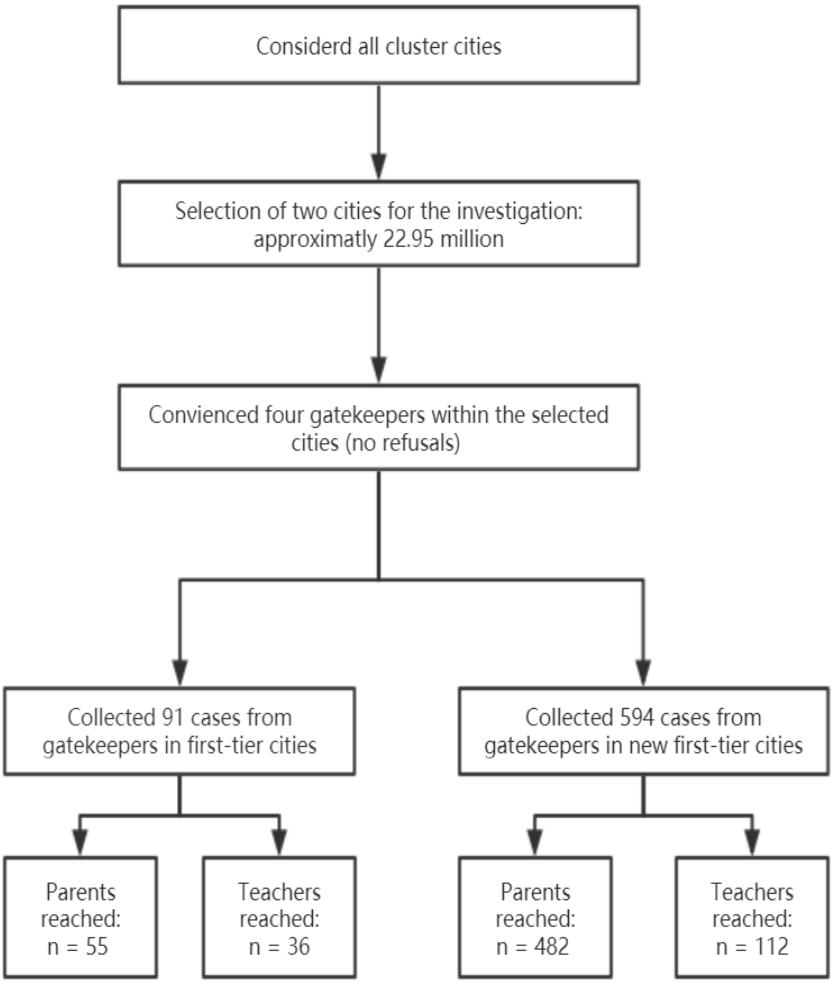
3.2 Sampling and Procedures

3.2.1 Access and Recruitment

The study population is comprised of Chinese parents and teachers that opted in, who were from schools with well-equipped technologies and adequate digital communication systems. Participants were also parents and teachers of pupils from grades 4–9 at comprehensive schools. In order to reach parents and teachers, a two-step, non-probability sampling procedure was chosen (see Figure 3). At first, the purposive sampling selected teacher and parent participants from the first-tier and new first-tier cities in China, due to the objectives of the research design. The city-tiers criteria followed Yicai Global's (2017) formula of five measurements. Alternatively, purposive sampling effectively explores anthropological situations (Saunders et al., 2012) and ensures the primary data sources were from participants who have information technology skills. Next, convenience sampling was conducted through the conveniences of four gatekeepers in Zhejiang and Shenzhen provinces, associating provinces where the selected cities locate. The advantages of convenience sampling are efficient, cheap, and simple to execute (Jager et al., 2017).

In order to recruit participants, gatekeepers were contacted via email with an information sheet (see Appendix A) and an invitation letter (see Appendix B). The gatekeepers then contacted potential participants with a letter of informed consent and the survey links with private access. Participants were surveyed within each school if they were from grades 4-9 in public schools, at the right age (18 years old and older), willing to participate, and consented to the research. The online survey was open for five weeks from 1st March 2021. Additionally, the survey incorporated a mixed-mode approach (e.g., using email and WeChat app) to gather a broader sample of the relevant population.

Figure 3 Flow chart of the sampling procedure



3.2.2 Participants

Participants in the current study were parents or guardians (n = 53) and teachers (n = 40) from first-tier cities, and parents or guardians (n = 484) and teachers (n = 108) from new first-tier cities in China. The participating parents were primarily mothers ($n_{mothers}$ = 407, $n_{fathers}$ = 124, n_{others} = 6). All participants fully completed the survey. Table 1 shows the characteristics of the participants. Responses were anonymous, so teachers and parents cannot be linked using any common identifier, which was consistent with the ethics protocol of this study.

Table 1 Characteristics of the parent and teacher participants

	Parent *n* = 537			Teacher *n* = 148	
	Mother	Father	Others	Female	Male
First-tier city	48 (11.8%)	3(2.4%)	2	27(21.8%)	13(54.2%)
New first-tier city	359 (88.2%)	121(97.6%)	4	97(78.2%)	11(45.8%)
Total	407(100%)	124(100%)	6	124(100%)	24(100%)

3.3 Data Collection

Data was collected using an online survey containing two sections. The first section of the survey was the Digital Communication Scale (DCS), an instrument constructed by Kuusimäki et al. (2019). The second section of the survey included open-ended, qualitative questions. The qualitative data aims to explore the contents behind the PTP in their digital communication.

The previous study in Finland on which DCS was based helped establish the construct validity of the DC rating scale. In addition, a pilot study was conducted with Mandarin-speaking professionals in the field. The biggest advantage of conducting a pilot study was encouraging a higher standard of validity in the final research study (Foddy, 1994). Following these pilots, improvements were made to ensure that the survey could collect data that would ultimately answer the study questions. For instance, some wordings of the questions were modified to meet the Chinese audiences' cultural understandings.

3.4.1. Quantitative Data Collection: Digital Communication Scale

The DCS reflected Kuusimäki et al. (2019) long-term practical knowledge on PTP and communication. The selected 22 items in the DCS correspond to three dimensions that define communication in the theory of overlapping spheres of influence and its emphasis on well-

functioning communication. These three dimensions were intended to measure to what extent a participant views the elements of digital communication: (1) *informativity, frequency, and effectivity*; (2) *quality* and (3) *clarity and readability*. All items were rated on a 4-point Likert scale (1 = strongly disagree, 2 = disagree somewhat, 3 = agree somewhat, and 4 = strongly agree). There were two versions of the DCS in the survey. The teachers' version consists of 17 items, while the parents' version consists of 21 items; there are 16 common items. In Table 2, the means and standard deviations of responses of parents and teachers are shown. Table 2 indicates the high average self-regulation ratings for most items (apart from items 7, 8, 9, 17, and 22 for parents and 6 for teachers) and relatively consistent standard deviations across items.

Table 2 The Digital Communication Scale (DCS)

	Item/label	Parents M (SD)	Teachers M (SD)
(1)	*Informativity, frequency, and effectivity*		
1.	Network platform has increased the frequency of communication with teachers/parents	3.56 (.56)	3.51 (.70)
2.	I receive various kinds of information about my child's studies/I can give various kinds of information about my pupils' studies	3.47 (.60)	3.32 (.74)
3.	I get enough information about happenings in the classroom/I can give sufficient information about happenings in the classroom	3.24 (.75)	3.24 (.75)
4.	I get enough information about my child's strengths/I can give sufficient information to parents about the pupils' strengths	3.19 (.77)	3.05 (.68)
5.	I get enough information about my child's improvements in grades/I can give sufficient information about my pupils' improvements in grades	3.30 (.75)	3.05 (.69)
6.	I get enough information from parents about matters affecting the pupils' schooling		3.05 (.79)
7.	I get fewer messages about my child's schooling via DC	2.20 (.90)	

8.	I get enough information about all school matters	3.35 (.68)	
9.	I can respond to teachers' messages concerning my child	3.55 (.66)	
(2)	*Quality*		
10.	Teachers' digital communication supports my child's overall development/my digital communication supports pupils' overall development	3.05 (.78)	3.03 (.69)
11.	Digital communication supports educational partnership	3.22 (.68)	3.17 (.58)
12.	Digital communication supports the feeling that I am heard when speaking about my child's studies/… When I am informing parents	3.03 (.77)	3.12 (.62)
13.	Digital communication encourages me to actively involved in school activities/…Encourages parents to actively involved in school activities	3.26 (.65)	3.18 (.64)
14.	Digital communication support trust-building between parents and teacher	3.32 (.61)	2.01 (.55)
15.	Digital communication makes me actively talk about my child's studies/…My pupils' studies	3.21 (.68)	3.12 (.62)
16.	I can support teachers' educational work /parents' educational work with my digital communication	3.41 (.60)	3.18 (.60)
17.	Teachers' digital communication is encouraging to my child	3.43 (.64)	
(3)	*Clarity and readability*		
18.	I would like my child's conflicts to be communicated/it is better to inform parents about pupils' conflicts through dc	3.00 (.74)	2.82 (.79)
19.	Digital communication involves misunderstandings with teacher/with parents	1.73 (.85)	2.01 (.80)
20.	School sends overlapping digital messages	2.26 (.88)	2.45 (.85)
21.	All teachers of my child/all parents at my class have adopted compound (similar) way to communicate with me digitally	3.35 (.59)	3.23 (.62)
22.	I read all the messages that teacher sends	3.60 (.58)	

3.4.2 Pilot Survey

After contacting and receiving the concern of DCS usage by Kuusimäki et al. (2019), the DCS was translated into Mandarin from the original language Finnish, through a two-step process.

The routine of the two-step process was from Finnish to English, then English to Mandarin. The main challenges lie in work organisation and languages belonging to different "language forms" (Aitchison et al., 1997, p. 135). The final survey in Mandarin was translated back to English by a peer whose mother tongue is English, and has no knowledge of the survey. This back-translation process allowed the researcher to confirm DCS's application in cross-cultural social research settings (Tyupa, 2011).

Due to the replicability and multilinguistic nature of the current measuring instrument, a pilot survey was undertaken to ensure the reliability and validity of the measures (Bhattacherjee, 2012). It was conducted with two current teachers in a first-tier city and two current teachers in a new first-tier city in China, taught year groups between the ages of 10 and 15, who used digital communication tools to contact parents. These teachers all received the information letter (see Appendix A) and consent to participate by signing a consent form (see Appendix C). In addition, teachers were asked to complete the survey and comment on the length of the survey, consistency of the scales, and how they felt about the regularity in language and cultural accessibility within the survey instrument (Ferketich et al., 1993).

Based on teachers' feedback, changing the question's wording from "digital platforms" to "online communication platforms" is presented, to be more accessible for the eldest participants. Teachers also reported that it was difficult for them to track how frequent and how many responses they would get from pupils' parents, considering the large class size in China. Thus, the item "I get responses from parents to my messages concerning pupils" in the teachers' version in the previous study was moved to the parents' version, named "I can respond to teachers' messages concerning

my child". Furthermore, this pilot study highlighted Treece and Treece's (1986) argument that everyone interprets words differently. Consequently, descriptions of the common communication approaches of "digital communication" were also provided in some questions. Finally, the pilot study ensured that no questions would harm any participants, ultimately the researcher's primary obligation (DiCiccoBloom & Crabtree, 2006).

3.4.3 Qualitative Data Collection

The open-ended survey approach will aid in the qualitative response to the participants' views about the contents of DC. Respondents can provide information in free text in open-ended questions (O'Cathain & Thomas, 2004). In order to include a broader range of answers from parents' and teachers' experiences, three open questions were asked: (1) "What kind of matters would you like to be communicated digitally?" (2) "What kind of matters would you not like to be communicated digitally?" (3) "What is your attitude towards receiving information in digital communication channels?".

The qualitative data were submitted to content analysis, which extracts reproducible and reliable inferences from a text (Krippendorf, 2004) by categorising these into mutually inclusive categories. The aggregate responses of the first two questions served as the analytical unit. This study focused on the combined perspectives and expectations on DC contents, yielding 537 parents' responses and 148 teachers' responses.

The qualitative questions about attitudes assigned the variable of individual characteristics in the attempt to answer the RQ2. The respondents' attitudes towards DC were categorised into binomial groups (i.e., positive/neutral, negative) corresponded individual factors which may predict their views of DC. In general, parents and teachers were positive or neutral toward DC (see Appendix F). Positive attitudes included feelings of interest and happiness, and negative attitudes included feelings of worried and antipathy. 45% of parents answered that "I feel interested when I receive a message from teachers through DC (translated)".

3.4 Data Analysis Strategies

All statistical analyses were performed using IBM SPSS Statistics version 27 and AMOS 26.0 software package.

3.4.1 Research Question 1 – Exploratory Factor Analysis & Confirmatory Factor Analysis (CFA)

There were three phases of examining the factorial structure of the DCS. First, the factor structure of DCS of parents' data and teachers' data was investigated with Exploratory Factor Analysis (EFA), following Kuusimaki et al. (2019). The EFA was then conducted following the statistical analysis method in the previous study by Kuusimäki et al. (2019): maximum likelihood extraction with a direct oblimin rotation a priori specifying three factors. Second, an EFA with varimax rotation was performed specifying eigenvalues > 1 as extraction criteria, suggesting four factors would reasonably represent the data and a four-factor structure of the merged data set; Cronbach's alpha was used to confirm the internal consistency (Cronbach, 1984). Finally, a Parallel Analysis was conducted for determining the number of factors or components to retain

(Watkins, 2000). A CFA was then performed using maximum likelihood estimation to examine all models' goodness-of-fit and confirm the best fit model.

Suitability of the Data

A Principal Component Analysis (PCA) was conducted to confirm the suitability of the data for EFA, using the Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity (Dziuban & Shirkye, 1974). PCA is an adaptive data analysis technique for "reducing the dimensionality and increasing interpretability" (Jolliffe & Jorge, 2016). For example, PCA could predefine the percentage of total variance explained: to decide how many principal components should be retained. Before examining the exploratory factor models of the DCS, three assumptions must be established and examined (Pallant, 2020). First, an inspection of the correlation matrix revealed the presence of a coefficient of 0.35 and above. Second, the Kaiser-Meyer-Olkin test confirmed sampling adequacy, 0.93 for parents and 0.84 for teachers, exceeding the recommended value of 0.6 (Kaiser, 1970). Finally, Bartlett's (1954) Test of Sphericity supported the factorability of the correlation matrix, because both parent and teacher groups reached statistical significance.

Exploratory Factor Analysis (EFA)

EFA is often used in the early stages of research to explore the interrelationships among a set of variables. Initially, the separate parents' and teachers' data sets underwent EFA to get a one-factor structure for both parents and teachers in China. Then a three-factor structure was extracted by replicating the same analytic procedures (i.e., a priori specifying three factors) from the previous study in Finland. In detail, an EFA was performed, using the maximum likelihood

extraction with direct oblimin rotation method, with items loading greater than or equal to 0.35, and eigenvalues above 1 for both parents and teachers. Ultimately, the separated datasets of two respondent groups were emerged based on consistency, and items 7, 8, 9, 17, and 22 for parents and item 6 for teachers were not comparable, and therefore excluded from the EFA. An EFA with an emerged dataset then used varimax rotation and maximum likelihood extraction to enforce a four-factor solution of the DCS. Items loading greater than or equal 0.43, and common factors with eigenvalues above 1 were included in the structure. Inter-correlations then assessed preliminary relationships among factors extracted from the EFA. Cronbach's alpha interpretation is complicated by a lack of consensus on the optimum range of acceptability. An acceptable range of Cronbach's alpha is 0.70 or above, derived from Nunnally's guideline (1978). The Pearson correlation coefficient will indicate the strength between every two variables, interpreting by Cohen's (1988, p. 79-81) guidelines: small r = 0.10 to 0.29; medium r = 0.30 to 0.49; large r = 0.50 to 1.00.

Confirmatory Factor Analysis (CFA)

Going beyond the initial study of Kuusimaki et al. (2019), a CFA was performed for three reasons: (1) CFA is stricter than EFA, as only a priori patterns of loading are specified; (2) goodness of fit indices facilitate formal model comparison; (3) models to be compared are specified in advance (i.e., theory-driven).

A CFA was conducted in the AMOS 26.0 software package: to test dimensions alongside subfactors of 12-item DCS in each model using the merged data (n = 685). A CFA with maximum likelihood estimation tested three prior models: (1) A one-factor solution is expected to fit poorly,

indicating that the instrument is indeed multi-dimensional; (2) A three-factor solution posed by Kuusimaki et al. (2019); (3) An EFA extracting factor with an eigenvalue above 1 suggested four factors.

The goal of comparing statistical models is to specify a model that fits the data (Maruyama, 1998). To evaluate the models' goodness of fit, several statistics were used: overall chi-squared test, Comparative Fit Index (CFI), Tucker-lewis index (TLI), Standardized Root-Mean-Square Residual (SRMR) and Root-Mean-Square Error of Approximation (RMSEA) (Willmer et al., 2019). Given the null hypothesis that the stated SEM fits the data, the chi-squared statistic has an associated p-value; consequently, a p-value greater than 0.05 indicates a strong model fit (Field, 2009). A CFI or TLI value close to 1 suggests a strong model fit, with values over 0.9 being mainly acceptable and values over 0.95 being excellent (Hooper et al., 2008). Technically, RMSEA is a "badness-of-fit index" (Kline, 2011, p. 195), with a value of 0 indicating ideal model fit. SRMR values below 0.06 and RMSEA values of less than 0.08 (Hu & Bentler, 1999) are considered acceptable criteria for model fit. As will be shown in the 4-factor solution fitted the Chinese data best.

3.4.2 Research Question 2 – Structural Equation Model

As will be shown the four-factor solution fitted data best. Consequently, the four-factor solution was used in a Structural Equation Modelling (SEM): to examine the influence of covariates - participants type, gender, attitude, and locations. The four factors were regressed on

the covariates simultaneously, instead of four separate regression models. SEM is a powerful tool for analysing complex causal relationships between variables.

Preliminary assumption testing was conducted to check for normality, linearity, univariate, and multivariate outliers. The sample size was reasonable, with more than the required number of cases per cell (Pallant, 2020). The Mahal. Distance of the data set is 44.00 larger than the critical value of 18.47 for four dependent variables (Tabachnick & Fidell, 1996), suggesting the presence of multivariate outliers. The Mahalanobis distance indicated the outliners, cases with any value bigger than the critical value 18.47 were removed from the data file (n = 21). The SPSS outputs showed that there were no serious violations has been noted.

As evidenced in the previous studies, Kuusimäki et al. (2019) claimed that Finnish teachers seemed more negative than parents towards DC, and that mothers generally put more parental involvement than fathers (Gestwicki, 1996). The previous study also indicated respondents' attitudes to DC in relation to their views of DC. Kuusimäki et al. (2019) controlled the attitudes as binary variables consisting of either "positive/neutral" or "negative" in their study. Findings by Oostdam and Hooge (2013) further confirmed that teachers' and parents' detached attitudes would have a negative impact on the PTP. Therefore, the individual factors, including participants' role, gender, and attitudes were considered as covariates in the present study. I hypothesise that the views of common themes of DC can be influenced by participant types, gender, and attitudes, such that participants with negative attitudes will exhibit lower scores on partnership relative to participants with positive attitudes.

The association between a geographical location (i.e., first-tier cities or new first-tier cities in China) and the domains of DC are also related to the question of parents' and teachers' views of DC. For example, a previous study in Finland indicated that teachers from an urban municipality experienced more unclear communications through DC than rural colleagues (Kuusimäki et al., 2019). The location was also included as a covariate, since previous research (CICA-BEQ, 2018) in China indicated a significant association between locations and parent-teacher partnerships. Thus, the hypothesis is that parents and teachers from two different locations view the role of digital communication in the common extracted factors differently.

3.4.3 Research Question 3 – Content Analysis

537 parents and 148 teachers from China responded to open-ended qualitative questions as part of the survey. The aggregate statements from parents and teachers concerning their perceptions and expectations about DC contents served as the analysis units. Content analysis was used to analyse the qualitative data from the open-ended questions in order to make reproducible and accurate inferences from the text (Krippendorf, 2004). The present analysis followed an inductive-oriented manner, which utilised all the codes derived from the data (Elo & Kyngäs, 2008). After multiple data readings and getting familiar with the content, the content analysis proceeded in three phases. First, all aggregate statements were reduced to codes (see Examples 1 and 2 below). Every time a new topic emerged; a new code was assigned. Statements that included more than one code were then divided among different categories, accordingly. These codes were then condensed into categories by grouping similar topics related to the same concern (Erlingsson & Brysiewicz, 2017). The parental data were coded and then followed the same categories to code the teacher data.

Example 1: “Information about lesson plans, pedagogical approaches, and children’s learning states in class” (aggregate statement translated from Mandarin from a parent)

- information about class, class events, school information (code) → Information about class (subcategory)

Example 2: “Provide parents with the information of their children’s test grades and my weekly comments for the whole class” (aggregate statement translated from Mandarin from a teacher)

- test grades, weekly comments, tutorials (code) → grades, evaluation (subcategory)

The subcategories thus formed were further combined into four main categories: *study-related matters*, *partnership-related matters*, *behaviour-related matters*, and *classroom-management matters*. For instance, the example (1) and (2) above, the main category was named study-related matters. A table of main categories and their subcategories of the contents that parents and teachers wish to communicate digitally will be presented in Chapter 4. During this phase of analysis, collaboration with other reviewers was used to increase the inter-rater reliability of the established categorisation. Inter-rater reliability (IRR) refers to the consistency of decisions between two reviewers, and is necessary for validity (Cook & Beckman, 2006). The IRR score was 76%, which was considered acceptable, following a rule of thumb of ≥75% (Blick et al., 2018). This result suggested the external consistency of the constructs, giving consistent estimates of the high degree of agreement between two reviewers (Hallgren, 2012). The excluded statements were also cross-checked and used direct quotes from participants in the research findings: to ensure the credibility of the research.

3.5 Ethics

Before beginning the study, ethical approval was provided by the Central University Research Ethics Committee (CUREC). The CUREC ethical approval notification is attached in Appendix D.

After receiving ethical approval, the sampling procedures were conducted, and the links of online surveys were opened to participants. On the first page of the online survey, participants were reminded of the study aims, general descriptions of the research, and a short introduction (see Appendix E). Information consent was obtained from all participants involved, since the participants were aware that the completion of the survey gives as consent. A "don't know" or "not applicable" answer option gave respondents autonomy to answer the survey questions. The online survey link opened for five weeks, and all responses were collected anonymously so none of the respondents could be identified.

Once the data download was complete, all datasets were stored on a password protected and encrypted laptop, and a backup was stored on the University OneDrive system, in compliance with current data protection (GDPR) legislation. The data collected was used exclusively for the purpose of the study. Initially, the study designed a consent form for teachers and an opt-out form for parents for releasing academic records of 150 pupils. However, procedures for collecting academic records were unsuccessful, and the gatekeepers could not access this data due to schools' data protection policies. Consequently, the study does not obtain informed consent for collecting academic records.

Chapter 4 Results

This chapter will present the results for the three research questions in turn. The first research question regarding the factorial structure of DCS was explored using EFA and CFA. Second, the results of the structure modelling equations that explored the differential effects of covariates on extracted factors of DCS will be described. Finally, the content analysis results regarding open-ended responses will be reviewed: to answer the third question on what parents' and teachers' perspectives towards the contents of digital communication are.

4.1 Quantitative findings: Research Question 1

This quantitative analysis phase is intended to answer the following research question and to investigate the factorial structure of the DCS following the analytic procedure outlined in section 3.4.1.

RQ1: What factors emerge from the digital communication scale (DCS) among Chinese parents and teachers?

In this section, Exploratory Factor Analysis (EFA) was conducted three times to indicate the one-factor structure, three-factor structure, and four-factor structure of DCS. The goodness-of-fit of all three models were then tested using a Confirmatory Factor Analysis (CFA), which compared how good each model fits and the best factor structure of DCS in studying the Chinese sample.

4.1.1 Exploratory Factor Analysis: One-factor structure

The results of the EFA suggested that one factor fits the data poorly, explaining only approximately 40% of the variance of parents' dataset and 38% of teachers' dataset. Although the Kaiser-Meyer-Olkin Measure of Sampling Adequacy for parents' and teachers' dataset was 0.922 and 0.844, indicating that the samples were adequate, and Bartlett's Test of Sphericity for both datasets gave a p-value <0.001. The χ^2 for the one-factor model was 1920.70 (df = 189) in the parents' dataset and 571.63 (df =119) in the teachers' dataset.

4.1.2 Exploratory Factor Analysis: Three-factor structure

To investigate whether the same three-factor structure in the prior study (Kuusimäki et al., 2019) could be derived in the Chinese sample, an EFA using direct oblimin rotation was replicated. From the original pool of 22 items, item 21 in the parents' version and item 17 in the teachers' version were extracted; item 7, 8, 9, 17, and 22 for parents and item 6 for teachers were not comparable (Table 2). Common factor extraction was based on consistency between the two respondent groups on communality and eigenvalue above 1 for both parents and teachers. Item loadings with $\leqslant$0.35 recommended by Kuusimäki et al. (2019) were excluded from the structure.

The replicated three-factor structure in this study explained 58% of parents and 59% of teachers of the total variance. The prior study explained an extra 7% (parents) and 17% (teachers) of the total variance. Sampling adequacy was confirmed by a Kaiser-Meyer-Olkin test (0.93 for parents and 0.84 for teachers). The correlation matrices were analysed using Bartlett's test of

sphericity, $p < 0.001$. However, the extracted factor structure of separated data sets was unclear; the items did not load on their expected factors (see Appendix G).

According to Kuusimäki et al. (2019), the extracted factors were F1: *partnership*, F2: *encouraging feedback*, and F3: *unclear communication*. Cronbach's alphas (Cronbach, 1984) confirmed the internal consistency of the three factors (F1: $\alpha = 0.92$ parents, $\alpha = 0.91$ teachers; F2: $\alpha = 0.80$ parents, $\alpha = 0.90$ teachers; F3: $\alpha = 0.78$ parents, $\alpha = 0.87$ teachers). The α values of all common factors ranged between 0.78 and 0.92, and were all greater than the required minimum of 0.70. Therefore, each individual dimension possessed good internal consistency in the Chinese sample.

4.1.3 Exploratory Factor Analysis: Four-factor structure

In the Parallel Analysis, more than three factors were indicated with raw data eigenvalue from the actual data greater than characterisation eigenvalues from random data, in disagreement with the previous three-factor solution. In order to compare data from both participants in the parent-teacher dyad to describe the same partnership, the two separated data sets into one (Tavakol & Dennick, 2011). Thus, seventeen merged items of DCS from both parents' version and teachers' version were subjected to EFA with a Varimax rotation to enforce a four-factor structure. The results of the EFA suggested that four factors explained 69.42% of the total variance for the entire set of variables. The rotated factor was labelled as F1: *partnership* (item 10, 11, 12), F2: *involvement* (item 13, 14, 15, 16), F3: *sufficiency* (item 1, 2, 3), and F4: *encouraging feedback* (item 4, 5), explaining 44.76%, 9.32%, 8.34% and 7.00% of the variance, respectively. In order to

extract a clear factorial structure, items loading ≥0.43 were included in the structure, resulting in four common factors with eigenvalues above 1.

The Kaiser-Meyer-Olkin values were 0.91, which indicates that the sample is adequate for EFA. Bartlett's Test of Sphericity reached statistical significance, supporting the factorability of the correlation matrix, and evidencing that the merged data were normally distributed. A Varimax rotation method resulted in high factor loadings for a smaller number of variables of the merged dataset. The remaining components all have eigenvalues of more than one (Stephens, 1996). The extracted factor structure of the merged data set was apparent, as presented in Table 3 (below). The higher factor loading for each item indicates a stronger relationship between the item and the factor (Pallant, 2020).

Table 3 Rotated factor structure of the common items of DCS from the merged dataset

Item	Loadings				Communality
	Factor 1: Partnership	Factor 2: Involvement	Factor 3: Sufficiency	Factor 4: Encouraging feedback	
1. Digital communication supports the feeling that I am heard when speaking about my child's studies/… when I am informing parents[2]	0.81				0.66
2. Digital communication supports educational partnership[2]	0.71			.	0.67
3. Teachers' digital communication is encouraging to my child's overall development /My digital communication is encouraging to pupils' overall development [2]	0.66				0.57

4. Digital communication support trust-building between parents and teacher[2]		0.75			0.74
5. I can support teachers' educational work/ parents' educational work with my digital communication[2]		0.74			0.69
6. Digital communication encourages me to actively talk about my child's studies/…my pupils' studies[2]		0.64			0.64
7. Digital communication encourages me to actively involved in school activities/…encourages parents to actively involved in school activities[2]		0.57			0.60
8. I receive various kinds of information about my child's studies/I can give various kinds of information about my pupils' studies[1 Infor1]			0.82		0.63
9. Network platform has increased the frequency of my communication with teachers/parents[1]			0.70		0.54
10. I get sufficient information about happenings in the classroom/I can give sufficient information about happenings in the classroom[1]			0.66		0.60
11. I get enough information about my child's strengths/I can give enough information to parents about the pupils' strengths[1]				0.83	0.67
12. I get enough information about my child's improvements in grades/I can give sufficient information about my pupils' improvements in grades[1]				0.79	.65
Eigenvalue	7.16	1.49	1.34	1.12	
% Of Total Variance	44.76	9.32	8.34	7.00	

Total Variance	69.42%

[1]Epstein's dimension informativity, frequency, and effectivity of digital communication. [2]Epstein's dimension quality of digital communication. [3]Epstein's dimension clarity and readability of digital communication.

The Cronbach's alpha reliability test was run to ensure that the factors were appropriately grouped (Table 3). Internal consistency dependability was assessed by average inter-item correlation. Cronbach's alphas (Cronbach, 1984) confirmed the internal consistency of the three factors (F1: $\alpha = 0.87$; F2: $\alpha = 0.91$; F3: $\alpha = 0.85$; F4: $\alpha = 0.89$). The α values of all extracted factors of DCS were greater than the required minimum of 0.70. As shown in Table 4, the final model revealed strong correlations among all extracted factors to each other.

Table 4 Correlations of the extracted factors of DCS

Extracted Factors	1	2	3	4
1. Partnership	1	-	-	-
2. Involvement	0.79	1	-	-
3. Sufficient	0.59	0.61	1	-
4. Encouraging Feedback	0.57	0.64	0.59	1

Note. The factors were standardized to have a mean of 0 and a standard deviation of 1. n = 685; M = 0; SD = 1.

4.1.4 Confirmatory Factor Analysis

As the EFA suggested a four-factor solution, as described above, the model was specified with four latent factors (partnership, involvement, sufficiency, and encouraging feedback). Standardised coefficients were used, and maximum likelihood estimation was used as the model parameter appraisal, because the items showed acceptable skewness and kurtosis. As shown in Table 5, skewness and kurtosis values were within the range for maximum likelihood estimation,

following the suggestion by Kline (2011) with the absolute value of the skewness less than 3 and the absolute value of the kurtosis was less than 10. Observations with missing values were excluded.

Table 5 Mean scores, standard deviation, skewness, and kurtosis of the extracted four factors

Factor	Mean	Standard Deviation	Skewness	Kurtosis
F1: partnership	0.73	0.88	-0.78	1.89
F2: involvement	0.74	0.90	-0.31	1.97
F3: sufficiency	0.65	0.90	-1.13	4.15
F4: encouraging feedback	0.67	0.91	-1.11	2.57

In order to compare the four-factor model of 12-item DCS against the rest of the models, CFA was first specified with just one latent factor (parent-teacher DC) using maximum likelihood estimation. Additionally, inspired by a previous study by Kuusimäki et al. (2019), CFA was then performed using maximum likelihood estimation in the three-factor model, and finally in the four-factor model. Figures 4-6 show all the attempted models with the 12-item DCS in the merged data set.

Figure 4 Model 1: One-factor structure for DCS

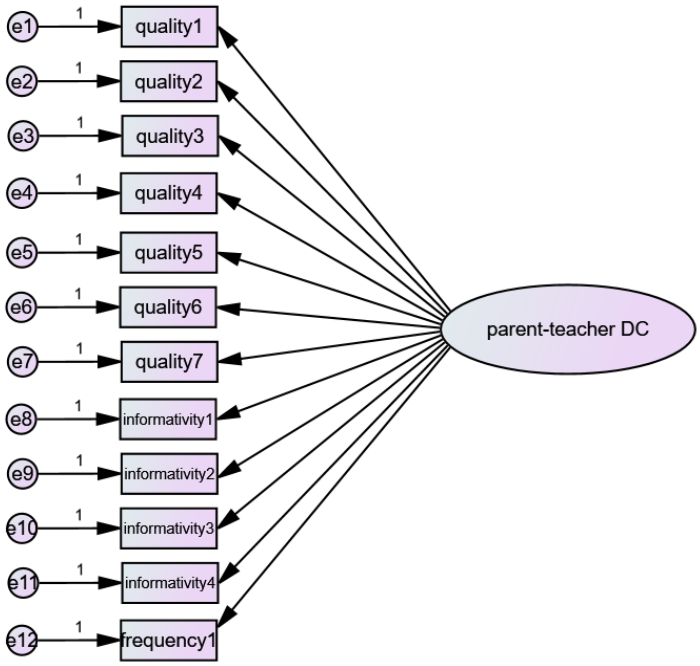


Figure 5 Model 2: Three-factor structure for DCS

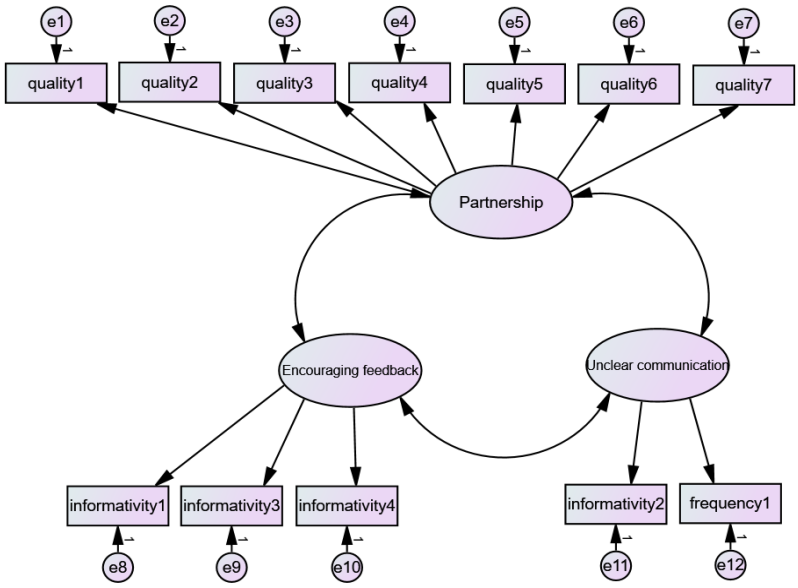
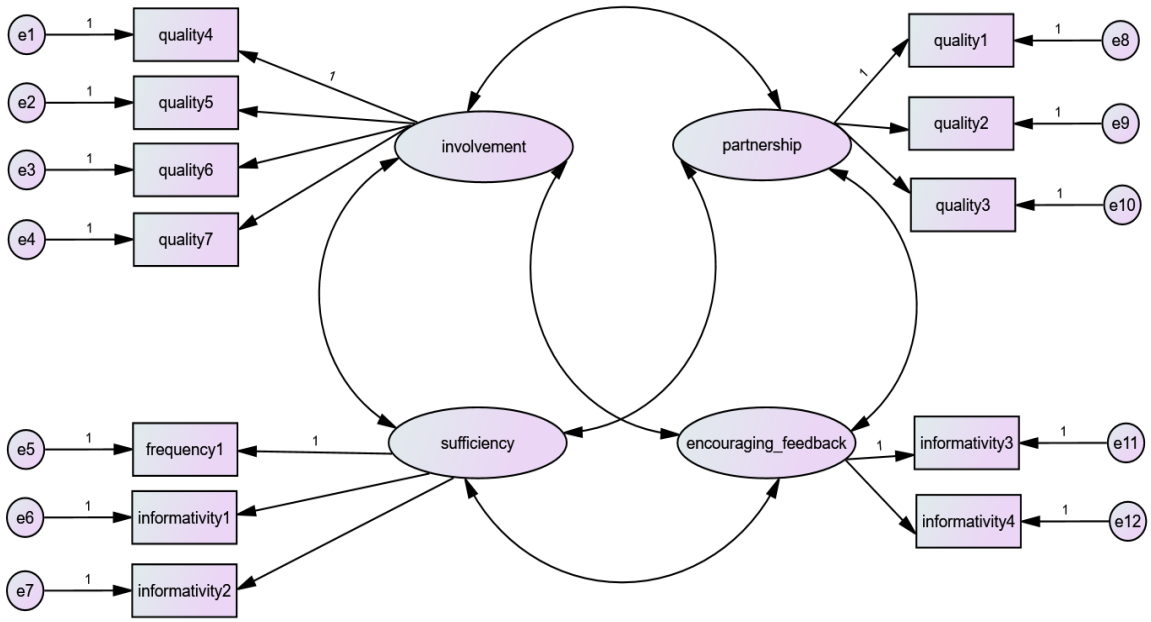


Figure 6 Model 3: Four-factor structure for DCS



After estimating the model, goodness-of-fit statistics were obtained, as described in section 3.4.1. As shown in Table 8, the four-factor model showed a very good fit, with a sample size of 685 yielded an RMSEA of 0.058 and an SRMR of 0.014. Hu and Bentler (1999) suggested the threshold for good fit using the maximum cut-off value of .06 for RMSEA and 0.08 for SRMR. Also, values above .95 indicated a good model fit for the TLI and CFI (Hooper et al., 2008), which the four-factor model obtained desirable magnitudes (TLI = 0.97; CFI = 0.98), indicating a good fit between the four-factor model and the data. Both the one-factor and three-factor models did not show a good fit, with both TLIs and CFIs below 0.95.

Table 6 Goodness-of-fit statistics for all models

Fit statistics	One-factor model	Three-factor model	Four-factor model
Chi2 (df) p	1492.54(54) p <.001	924.13(51) p <.001	159.56(48) p <.001
CFI	0.747	0.846	0.980
TLI	0.691	0.801	0.970
SRMR	n.a.	0.039	0.014
RMSEA	0.197	0.158	0.058

Note. n.a. = not available.

4.2 Quantitative findings: Research Question 2

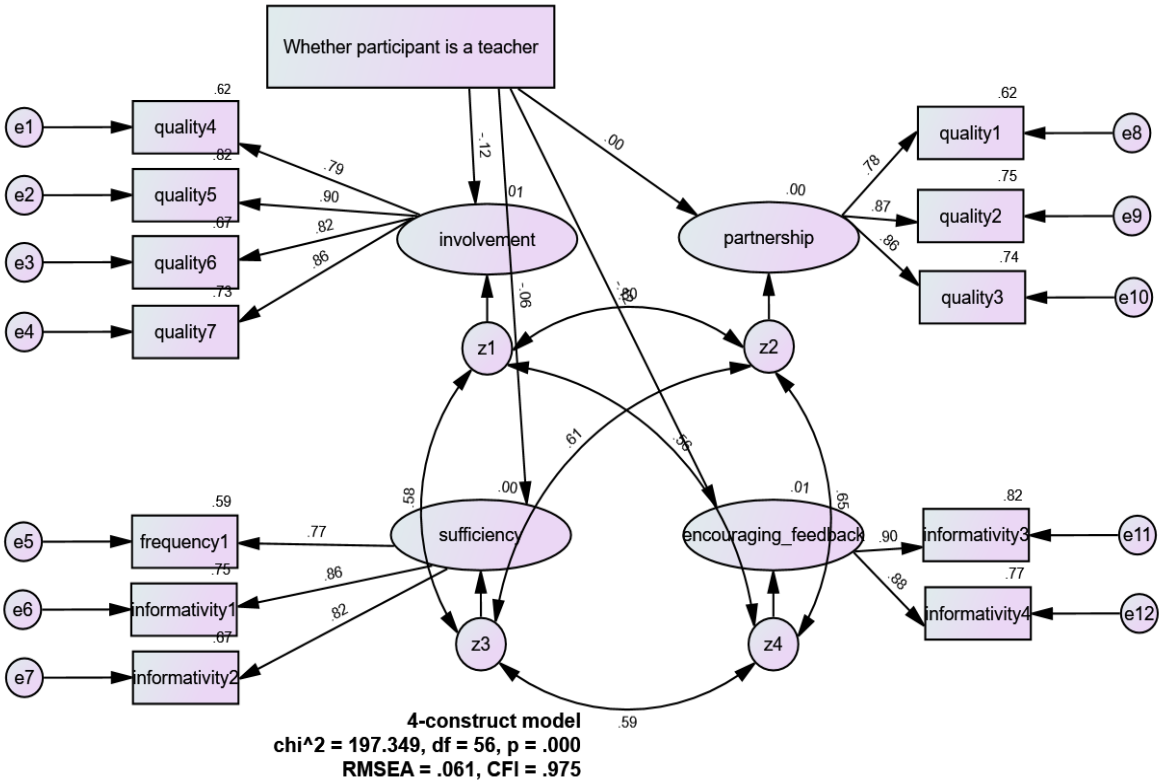
This quantitative analysis phase is intended to answer the following research question and investigate how respondents' individual and geographical features moderate the extracted four factors of the DCS.

RQ2: How do individual and geographical characteristics of respondents predict their views of digital communication?

In section 3.4.2, one hypothesis was that the participant types, gender, attitudes, and location would influence their views of DC on extracted factors differently. The characteristics of respondents were assigned as covariates and extracted common factors from the four-factor model as latent variables. Each covariate was entered in turns predicting all four factors of DCS in the Structural Equation Modelling (SEM).

Before examining the influence of various covariates in the four-factor model, preliminary assumption testing was conducted to check for normality, linearity, univariate, and multivariate outliers. The sample size was reasonable, with more than the required number of cases per cell (Pallant, 2020). The Mahal. Distance of the data set is 43.04, larger than the critical value of 18.47 for four dependent variables (Tabachnick & Fidell, 1996), suggesting the presence of multivariate outliers. The Mahalanobis distance indicated the outliners, cases with any value bigger than the critical value 18.47 were removed from the data file (n = 21). Homogeneity of variance-covariance matrices and multicollinearity, with no serious violations has been noted. As shown in Figure 7, within the best fit model (i.e., four-factor structure), the influence of all covariates: participant type, gender, attitudes, and locations on each latent construct was examined independently.

Figure 7 The SEM of 4-construct model



The standardised coefficients of the covariates on the extracted four factors of DCS are presented in Table 7. Comparing with a parent, being a teacher predicted less involvement and less encouraging feedback was recognised through DC. Compared with males, females generally responded that they were more involved in DC and viewed DC facilitating the parent-teacher partnership (PTP). On average, participants with positive/neutral attitudes towards DC, reported more involvement than participants with negative attitudes towards DC.

Table 7 Covariate effects of participant type, gender, attitude, and location on extracted factors of DCS

	Participant Type		Gender		Attitude		Location	
	β	ρ	β	ρ	β	ρ	β	ρ
Involvement	-0.14	**	0.13	**	0.15	*	0.01	

Partnership	-0.03		0.14	*	0.12	-0.05
Sufficiency	-0.02		0.07		0.11	0.08
Encouraging Feedback	-0.20	**	0.09		0.10	0.06

Note. Participant type (0 = parent, 1 = teacher), gender (0 = male, 1 = female), attitude (0 = negative, 1 = positive/neutral), location (0 = first-tier city, 1 = new first-tier city). Covariate effects are standardised coefficients from AMOS 26.0. *p < 0.05; **p < 0.01; ***p < 0.001.

4.3 Qualitative findings: Research Question 3

The qualitative findings will answer the following research question about the difference between parents' and teachers' views of the contents of digital communication.

RQ3: Do parents and teachers differ or have the same views about the contents of digital communication?

4.3.1 Context Analysis

To uncover parents' and teachers' views of the contents of DC, content analysis was undertaken on the textual data collected from the response to three open-ended questions at the end of the questionnaire. Each parent or teacher could report several contents; statements may contain multiple codes, and each code was divided into distinct and independent categories. This section will describe the number of responses in each category using inductive-oriented analysis strategies, then describe the participants in each category achieved by using sub-categories and codes.

Table 8 The contents parents and teachers wish to communicate digitally

	Number of parents referring to the category (N = 537) n	Number of teachers referring to the category (N = 148) n

1. Study-related matters		
(1.1) Information about class activities	290	48
(1.2) Performance in class	355	106
(1.3) Grades, evaluation	356	40
2. Partnership-related matters		
(2.1) All events affecting the child's studies that require parental and teacher support	190	60
(2.2) Information about school events	257	92
3. Behaviour-related matters		
(3.1) Conflicts	107	21
(3.2) Prosocial	315	66
4. Classroom-management matters		
(4.1) Forgetfulness	80	46
(4.2) Break class disciplines (being late, leave class without permission, interference others)	196	95

After following the three phases of content analysis, the sub-categories formed further combinations in four main categories. Open-ended responses were categorised into four categories: *study-related matters*, *partnership-related matters*, *behaviour-related matters*, and *classroom-management matters*. As shown in Table 8 above, the largest category was labelled as *study-related matters* (n = 1195), included information about class activities, pupils' performance, grades, and evaluation. The following examples reflect the definitions of the codes that were classified under this category: "Information about lesson plans, pedagogical approaches, and children's learning states in class" (Parent) and "Provide parents with the information of their children's test grades and my weekly comments for the whole class" (Teacher). Some teachers saw the digital platform as a medium to provide continuous information to parents; for instance, "digital platforms allow me to provide photos and text descriptions of students' performance during the learning activities

timely". Ultimately, teachers saw that the constant and visualised information delivered through digital platforms would facilitate parents' cooperation, by stating "the vivid presentations allow parents become more supported" (Teacher).

The second-largest category, *partnership-related matters* (n = 599), included aspects of all events affecting the child's studies that require parental and teacher support, and information about school events. The following statements exemplify the parents' aspects of all events affecting the child's studies: "The teachers shall provide parents with guidance, programmes for youth mental health education, and professional advice" (Parent). Informing parents about information involving school events was seen as essential, as this example reveals: "Parents hope to be informed about extracurricular activities, reading tutoring and school-related activities school" (Teacher). The following statement shows parents' comment to DC in enhancing the partnership with teachers: "The use of DC has increased the cooperation between home and school, teachers were very considerate in guiding parents to assist children's development".

The third category, *behaviour-related matters* (n = 509), included conflicts and strengths. The statements in category conflicts covered issues that arguments or disagreements with teachers and classmates at school were considered to be communicated in-person, instead of digitally and majorly agreed by parents and teachers. The following statements exemplify the parents' view of receiving conflicts: "It will be clearer and more effective to discuss the sensitive and complex issues by telephone calls or face-to-face communication than DC" and "I hope the negative circumstances to be informed through calls or in-person meetings. It will make me understand the

situation better." Prosocial is described as follows: "Prosocial behaviour and spirits, for instance, showing patience and caring to others" (Parent).

The fourth category, *classroom-management matters* (n = 417), concerned pupils' forgetfulness and break class disciplines. The following statements exemplify the forgetfulness of a child: "If forgetting school materials and tasks assigned by the teacher, parents don't have to be always informed" (Parent). Teachers viewed class-management matters as valuable indicators for changing their educational practices and should not be reviewed or reported independently without contexts. The following examples refer to break class disciplines: "The students have a poor foundation and cannot understand the content of my class, so they were fidgeting and disturbing others in class" (Teacher) or "Some of my students were posting negative comments (in the online learning platforms) to get my attention" (Teacher).

Chapter 5 Discussion

This chapter will discuss the findings of this study thoroughly. Overall evaluation, including the significance and limitation of the study, will be then discussed. Finally, suggestions for future research and practical implementations for practitioners will be shared before concluding this study.

5.1 Restatement of Research Questions

RQ1: What factors emerge from the digital communication scale (DCS) among Chinese parents and teachers?

The first research question was to use EFA and CFA to investigate the factorial structure of the DCS in a sample of Chinese parents and teachers. The results of the EFA seems to favour a four-factor structure, which explained 69.42% of the variance of the merged dataset. CFA was then performed using three different models: one-factor, three-factor, and four-factor. Several Goodness-of-fit statistics indicated that the four-factor model showed an overall good fit, with a sample size of 685 yielded an RMSEA of 0.058 and an SRMR of 0.014.

RQ2: How do individual and geographical characteristics of respondents predict their views of digital communication?

The different views of digital communication among Chinese participants were explored. The four-factor structured DCS was used to elucidate participants' views on *partnership*, *involvement*, *sufficiency*, and *encouraging feedback*. In contrast to the studies that previously

indicated less stratification of parents in involvement and partnership practices, the current study found a significantly less appreciated digital communication (DC) for encouraging involvement and providing and receiving encouraging feedback from teachers than the parents did. More specifically, views on DC in encouraging involvement regarding two characteristics of the participants: gender and attitudes towards DC. Noteworthy is the fact that participants in this study generally had positive or neutral attitudes about the values of DC, which was in line with the previous literature that Chinese parents or teachers generally had positive beliefs about the digital teaching and learning methods than the traditional method (Dong et al., 2020). In this study, the positive attitudes towards DC significantly indicated its benefit of encouraging involvement. When female and male participants were compared, a statistically significant difference was detected in their views of digital communication in building and maintaining the parent-teacher partnership (PTP).

RQ3: Do parents and teachers differ or have the same views about the contents of digital communication?

Four categories related to DC content were identified: *study-related matters*, *partnership-related matters*, *behaviour-related matters*, and *classroom-management matters*. It seems that most views were concerning study-related matters and partnership-related matters in the contexts of DC. The results align with the correlations of observed themes of DC in this study, which found that DC involvement serves PTP well by providing sufficient information about pupils' studies and happenings in the classroom. The least favoured information by both parents and teachers seemed to be the conflicts of pupils.

5.2 Discussion of Findings

5.2.1 The Four-factor Structure of the Digital Communication Scale

In a previous study, the DCS was developed by Kuusimäki et al. (2019): to study parent-teacher communication on a digital platform, indicating a three-factor structure with the Finnish population. However, the factorial structure of DCS that followed the previous Finnish analysis procedures was unclear in the Chinese sample. Therefore, this study went beyond the previous model by testing and comparing the best model fits in the Chinese population.

Results from section 4.1.4 indicate that the EFA seemed to mainly favour the four-factor solution of the DCS in a merged sample of Chinese participants, which explained 69.42% of the variance. Then, a CFA confirmed that the four-factor structured DCS to elucidate Chinese parents' and teachers' views on *partnership*, *involvement*, *sufficiency*, and *encouraging feedback* digitally (Table 5). It is worth noticing that the *involvement* and *sufficiency* factors were not diagnosed in the previous findings of parents' and teachers' views of DC in Finland. However, Cheng and Chen (2018) stated that the involvement behaviours in China correlate to the observed partnership features. Although the concept of parental involvement is different from PTPs (Minke et al., 2014), the former's direct effect on parents' and teachers' views of their PTP has been highlighted in many Chinese policy documents. For instance, the *Basic Behaviour Norms of Parents' Family Education* (ACWF, 2004) clarified the importance of inviting parents to be involved in decision-making as one of the partnership strategies of schools. The factor *sufficiency* reflected the high quantity of DC facilitated by digital platforms' transparent and timeless features (Bauch, 1998).

Chinese parents and teachers largely agreed that DC has aided their partnerships, their commitment to build and maintain partnership through digital channels was also reflected in the positive attitude towards DC expressed by both of them. Particularly in terms of feeling heard while discussing their children's studies, they also largely viewed that DC have aided their opinions on the development of PTPs. Both parents and teachers appreciated being informed and providing information about their children's studies and school activities. Because of the sufficient, frequent, and various kinds of information that have been shared via DC, both parents and teachers agreed that a trusting relationship had been established between them. Moreover, the item rated highly on the entire DC scale by Chinese participants was *digital communication supports provide/receive encouraging feedback about child's strengths*.

Several reasons could cost the different factorial structures between the Kuusimäki et al.'s (2019) findings and the present study. Firstly, the current study sample was Chinese; the education system and the penetration rate of internet users are different from Finland. Secondly, the previous Finnish study and the present study differ in sample size and the ratio of the two types of participants. Previous studies have a larger size of parent participants and more minor teacher participants to this study, making a large ratio of participating parents verse participating teachers. Thirdly, the sample in this study was different in locations: all the participants were from urban cities in China, while participants in the previous Finnish study came from a mix of urban and rural areas.

Within the four-factor structure of DCS in the present study, the strong and positive relationship between involvement and partnership is consistent with previous literature. Firstly,

previous studies have shown academic-related partnerships are often seen with parents who are dedicating to the conceptions of involvement (e.g., Grolnick et al. 1997). This might be because parents see themselves sharing the educational responsibilities and power in making pedagogical decisions (Epstein & Sanders, 2002). As parents become more self-efficacy involved, the PTP seems to be established by sharing the complementary role and responsibilities in educating their children (Hoover-Dempsey et al., 1987; Epstein, 2010)

Also, considering the strong relationship between the volume and quality of digital-based communication and partnership building (Thompson, 2008), the finding of this study confirms a positive influence in terms of the quantity of information being shared with parents, and sufficient information may increase parents' understanding of schooling (Cheng & Chen, 2018). For example, Dauber and Epstein's (1989) study demonstrated how school programmes' sufficiency and activities were related to the positive effects of parental involvement practices. Secondly, the finding is also in line with the richness of overlapping spheres of influence that enable productive PTPs (Lunts, 2003; Lewin & Luckin, 2010). Multicultural studies have detected those teachers can take advantage of technologies in providing information on academic activities and positively influence parental involvement (e.g., Pomerantz & Moorman, 2010)

A previous study found a positive correlation between partnership and encouraging feedback among Finnish parents and teachers ($r = 0.526$, $p < 0.001$) (Kuusimäki et al., 2019). Palts & Kalmus (2015) also suggest that providing and receiving feedback predicted the effectiveness of communication and interactions. Similarly, strong positive relationships of encouraging feedback and all other observed latent variables also appeared in the present study. It is interesting because

such a relationship contrasts Li's (2003) statement that Chinese parents do not necessarily have perceptions of receiving positive feedback from teachers, because of the Confucian philosophy on continual persistence.

A cut-off of 0.43 as a rule of thumb to have a clean structure, item *enough information about child's strengths* and item *enough information about child's improvements in grades* has significant positive loadings on factor encouraging feedback, so this factor describes encouraging feedback reported Chinese participants through DC. Qualitative findings of the study also support this high correlation and high item loadings. In terms of the contexts of DC, parents highly valued the positive feedback of pupils' strength and direct feedback of pupils' learning progresses (consistent with Tanes et al., 2011). Through such digital communication, receiving and offering encouraging and frequent technology-enhanced feedback can accelerate parental involvement and more commitment to PTPs (e.g., Hoover-Dempsey & Sandler 1995; Smit et al. 2006; Oostdam & Hooge, 2013).

In conclusion, the four domains of DC are not as expected; two of them were different from the previous findings of parents' and teachers' views of DC in Finland. Positive links appear among all four extracted factors of DCS, in contrast to the previous study in Finland, which only found a positive correlation between partnership and encouraging feedback. The strength of the relationship between partnership and involvement, which is the strongest correlation over the other correlations, shows the importance of involvement in building PTPs through DC.

5.2.2 Respondents Differ in Their Views on Digital Communication

Results from section 4.3 indicate that parent and teacher participants viewed DC differentially. Teachers generally viewed digital communication as serving involvement lower than parents ($\beta = -0.14$, $p < 0.01$). The beta coefficient signifies that for each unit increase in the participant type (i.e., from parents to teacher), the involvement decreased by 0.14 units. This suggests that teachers were less agreed on building mutual trust with parents through DC, undermining teachers' commitments and motivations to engage parents (Epstein, 1991; Ames, 1993). This is an interesting finding that supplemented Dong and her colleagues' quantitative study (2020). Though Dong et al. (2020) discovered that half of the Chinese parents believed that DC had inspired their educational ideas and allowed them to collaborate into educational practises during the school discourse, their child's teachers were less positive about how DC facilitates parental involvement in educational activities.

Meanwhile, the present study indicated a significantly negative link between participant types and views on DC in providing and receiving encouraging feedback ($\beta = -0.20$, $p < 0.01$). This result is interesting because it conflicted with the previous study in Finland. In the previous study with a Finnish sample, Kuusimäki et al. (2019) indicated that Finnish teachers appreciated DC for giving positive feedback more than the Finnish parents. However, Chinese parents showed relatively and significantly more positive views on getting encouraging feedback through two-way DC. This phenomenon was in line with Leenders and her colleagues' study (2018), where two-way communication was highly valued by parents rather than teachers, because the former sees themselves being empowered as co-educators when providing and receiving feedback (Turnbull et al., 2011). It is worth noticing that this result arose only from 148 teachers in this study during

the urgent Covid-19 circumstance, where digital feedbacks were firstly established in Chinese national innovation. Chinese educators may concern more about the risk of delivering digital data or providing a substantial amount of technologically enhanced feedback rather than the degrees of feedback itself (Jiang & Monk, 2015).

Parents and teachers are generally believed to hold different perspectives of their responsibilities and professions (Epstein, 1995); therefore, it was unexpected to find that Chinese participants did not differ in their views on partnerships in digital channels. This perspective gap between both parties could lead to unequal responsibilities and act based on exclusive interest in the child the shared (Oostdam & Hooge, 2013). In contrast, it seems that Chinese parents and teachers in the present study collaborated and cooperated in education activities regardless of their mutual recognitions of building and maintaining partnership through their DC. It is important to remember that higher involvement indicated higher PTPs through DC, which was strongly and positively associated with partnership (see Table 4). Therefore, teachers who viewed DC as a tool serves less parental involvement, thus should be expected to view DC's function of partnership-building less than parents.

Moreover, a significant difference was detected between females' and males' views on DC in encouraging involvement ($\beta = 0.13$, $p < 0.01$). This signified that those females recognised communications through DC channels served involvement more than males. However, such a gap may be because the participants of this study were predominantly females. The gender distribution is consistent with earlier research (Palts & Kalmus, 2015; Kuusimäki et al., 2019), demonstrating that more females participated in family-school collaboration studies than males. This can be

viewed as a limitation, but it may also accurately represent the reality of mothers being more active in the PTP than fathers. Furthermore, females account for the vast majority of public-school teachers in China. The present study also detected a statistically significant difference in the views of DC in facilitating a PTP when two gender groups were compared ($\beta = 0.14$, $p < 0.05$). The female participants viewed DC as a useful tool that serves PTP more than male participants. This can shed light on the study by Kuusimäkiet al. (2019) that overall satisfaction with digital communication in supporting the PTP were primarily female participants.

Parents and teachers essentially held positive or neutral attitudes towards DC (see Appendix F for descriptive statistics), which was also detected among the previous study with Finnish participants (Kuusimäki et al., 2019). Positive or neutral attitudes towards DC significantly increased participant's views on enhancing involvement ($\beta = 0.15$, $p < 0.05$). Specifically, this can shed light on the study by Auerbach (1989) that teachers' positive attitudes indicate more practices of enhancing parental involvement, and Bauch's study (1998) that the transparent and timeless information exchange in digital channels positively influenced users' attitudes in engagement.

As for locations, when participants from first-tier cities and new first-tier cities were compared, no difference was found. In contrast to the significant difference between Finnish parents and teachers in rural and urban areas, this study did not replicate Kuusimäki et al.'s (2019) participants' geographical characteristics. Both areas in the present study were considered urban cities due to their high internet access (Schleicher, 2020).

Overall, views on DC in facilitating involvement were reflected in parents, and all participants expressed positive attitudes towards DC. The Chinese teachers' experience determined that DC encourages less involvement and fewer opportunities to provide encouraging feedback about pupils than the parents believed they had received. DC was recognised as facilitating the PTP building and maintained more by females than males. Participants in first-tier cities viewed DC similar to participants in new-first cities; differences were not found between these two locations.

5.2.3 The Views of Parents and Teachers Concerning the Contents of DC

The qualitative results of this study detected four main areas of expectations of Chinese parents and teachers concerning the content of DC. It appears that most study-related or partnership-related matters can be addressed effectively via DC. The results are consistent with qualitative findings in section 4.1.3, which found that parents and teachers saw DC as a valuable tool for enhancing their partnership, by providing various information about their children's overall development and facilitating the feeling of being heard when discussing educational decisions with each other. Effective DC fosters a strong partnership between parents and teachers by sharing frequent information about class activities and school events (Epstein, 2010). It also allows parents to accept and supervise their children's academic performance and behavioural problems (Deslandes et al., 1997; Carr et al., 2015).

Consistent with this study's qualitative findings, parents found that information about classroom events and their children's studies was sufficient and frequent. However, teachers may pay more attention when reporting classroom-management matters because many of those matters reflect children's negative behaviours in the classroom, including breaking class disciplines, which may

threaten the positive-digital communications between parents and teachers (Mautone et al., 2011). The parents seemed less appreciative to receive too frequent information about their child's forgetfulness. Overall, both parents and teachers valued the regular and diverse information regarding pupils' studies. Such collaborations allow them to share the responsibilities and power of assisting a child's learning and development: to significantly enhance PTPs (Epstein & Sheldon, 2002; Epstein, 2010).

Parents desire to know about their child's school behaviour (Kuusimäki et al., 2019). However, according to the current study, parents and instructors believed those child problems should be resolved in person or via phone conversations. Choosing the appropriate communication channel is critical because parents and teachers could speak openly and pro-actively about sensitive issues affecting children's wellbeings (Juniu, 2009). Teachers shall recognise that conflicts and sensitive matters are best dealt with by phone or face-to-face meetings (Palts and Kalmus, 2015). Communicating about the positive prosocial behaviours can enhance a parental affirmation of the values of schooling and parental involvement in children's adjustment (Cheung & Pomerantz, 2011). The contents involve children's continual self-improvement to attain moral ideals are considered essential on DC. In a Confucian ideology, Chinese parents highly emphasise children's moral endeavours (Li, 2003). Given the large number of study-related matters that require attention in this study, it would seem that the contexts of DC face the challenges of providing an appropriate proportion of children's academic development, behaviour, and emotional development (Barber, 1996). The growing demands connected to using the appropriate communication channel for various information can directly affect the PTP.

5.3 Overall Evaluation of the Research

5.3.1 Significance of the Research

This study has attempted to bridge a gap between two areas of study. Firstly, the study empirically examined and understood parents' and teachers' views of their partnership experiences within the same DC in China, only measured from one partner (either parents OR teachers) of the PTPs or offline communication settings in earlier Chinese studies. Previous researchers emphasised the shared responsibilities and capabilities within involvement practices when there is an online two-way communication that can be supported by statistical evidence. Also, this study integrated the four common themes in DC related to PTPs with the Chinese context, which was different from the views of DC in Finland. Although the gender and attitudes of participants slightly varied in their experiences of DC, Chinese parents and teachers were satisfied overall with digital communication in facilitating their partnership practices and providing and receiving sufficient information. These two features of the DC were seen as supporting the PTP and providing valuable information on children's development. Finally, the present study indicated that Chinese parents and teachers had the biggest concern of study-related matter through the contents of DC, coinciding with the Finnish participants in the previous study.

Overall, the current research project can benefit both practitioners and researchers. Firstly, adopting the DC and perspectives gap between parents and teachers towards the DC: to understand the overlapping spheres of influence in Chinese schools; can develop shared power and responsibilities to more effective PTP. Secondly, the participants' characteristics and aggregative views towards DC's contents add more detailed explanations of how and in what contents congruent expectations occurred in DC in Chinese schools.

5.3.2 Limitations of the Research

The limitations of this study are regarded in two categories: limitations of the sampling process and the limitation of the statistical analyses. Firstly, the non-probability sampling procedure selected a subset of the finite population under study, leading to bias and decreased generalisability (Tyrer & Heyman, 2016). Given the five-week time frame for this study and the restricted resources available for a master project like this one, the sampling research was considered appropriate. For the current study, a total sample of 685 parents and teachers is considered sufficient for EFA, CFA, and SEM. In the future, there could be more responses from teachers and parents by increasing response time.

Moreover, Lames & Busher (2012) raise concerns regarding the complexity of using technology for online surveys. This is a limitation of an online survey that could dissuade potential participants from participating in the study, causing coverage errors (Lavrakas, 2008). Due to the anonymity of online surveys, it is impossible to know whether the answers are given by specific individuals, causing the information provided by the respondents to be unreliable. Secondly, the data collection procedures of this study focused on the use of DC tools and took place on the Wen Juan Xing (问卷星). It assumed that the participants would have a basic experience using DC tools and understanding how online surveys work. However, such assumptions are limited by the characteristics of Internet users. Internet usage in China is further chartered by discrepancies of individuals' natural attributes (such as sex and age) or social attributes (such as educational background and income) (CNNIC, 2012). The greater the deviation, the lower the credibility of the Internet-based survey (De Vera et al., 2010).

The other limitation is regarding the statistical analyses. Firstly, the conclusion of how congruent perspectives between dyads of parents and teachers concerning specific children cannot be reached by the concurrent data. Previous studies stated that educational partnerships positively affect children's academic achievement and overall development (Sheldon & Epstein, 2005; Jerome, 2006, Kilgore, 2010). However, the class information and joined influence of PTP, particularly children they shared, was impossible to retrieve due to confidentiality restrictions by the gatekeepers. The limited information cannot link the corresponding DC from parents and teachers to the same child, and how their digital-enhanced PTPs influence students' academic records were unknown. Secondly, the limitation of statistical analyses lies with SEM techniques. SEM can only demonstrate that the model fits the data to a certain extent; nonetheless, even if the model has a perfect fit, this does not mean that the model accurately represents reality (Blunch, 2008).

5.4 Practical Implications and Future Research

The current study is based on the link between PTPs and their collaborative DC patterns. This question was explored by surveying Chinese parents and teachers and their experiences with DC, plus their obligations and power relationships in a PTP. At the same time, from the perspective of individual characteristics and the contents of DC, this study understood how individuals generate different opinions in DC, thus affecting the efficiency and quality of PTPs. This section will provide implications for practitioners to support and maintain PTP - through communication practices on digital platforms based on the research findings.

5.4.1 Development of Partnership Strategies Based on DC Patterns

The study reflects a trend in home-school communication in China. The way teachers collaborate and partnership with parents does not have to be one-way or offline. Teachers and parents are encouraged to actively use appropriate digital channels to immediately disseminate information, subject to rules agreed by both parties in advance.

Although Chinese educational policies and home-school relationship researchers have proposed many practical strategies for PTPs in the information age (MOE, 2015), there has been a lack of follow-up evaluation of implementations of DC in the actual practices. Existing DC adaptations mainly focus on parents' general views on distance learning and teaching (Dong et al., 2020), teachers' DC skills and training (EdTech Hub, 2020), and the effectiveness of digital education management (Zhong, 2016). However, the significance and effect of DC on PTPs has not been measured from the views of both parents and teachers. Suppose educational institutions successfully transition to include PTPs in their DC strategies. In that case, practitioners can improve the effectiveness of parental involvement and maximise the overlapping influence of both parties in supporting students' development.

The study confirmed a clear four-factor structure with a 12-item DCS from parent and teacher groups, including building and maintaining partnerships. In contrast to previous studies, which focused on one side of the understanding and experience of family-school communication, the findings of this study indicated that families and schools interacted in the digital platforms, and a two-way communication has been established between them. In addition, the positive correlation between successful PTP and the involvement of digitalised co-educational practices was

significantly stronger than the positive correlations among any other two factors. This means that PTPs are distinct from the concept of parent involvement (Minke et al., 2014), their relevance in digital-enhanced communication was recognised. As a result of this study, educational institutions should reconsider the effectiveness of DC in supporting parental involvement and pay closer attention to using it to aid in developing a PTP model. For example, institutions can record parents' and teachers' attitudes towards DC as part of their partnership strategies and prioritise empowering parents to share their thoughts on DC's content.

5.4.2 Provision of Scaffolding for Positive Attitudes and Shared Views

According to the SEM of this study, participants showed positive/neutral attitudes towards DC, and more substantial involvement through DC was significantly associated with positive or neutral views towards DC. In China's complex modern school environment, the institutions and strategists must guide parents and teachers to form a positive understanding of the importance of DC in influencing their children's learning processes, and promote the initiative and involvement of parents through modern technological means. Chinese parents and teachers in this study were generally positive about the value and benefits of DC and cooperation. Therefore, in addition to traditional communication channels, schools shall continue to emphasise using DC tools as a convenient means of communication between parents and teachers.

By establishing a mutual understanding, the best parent-teacher communication can create a conducive learning environment for children. Therefore, at the content level of DC, it is necessary to set up reasonable communication methods and means for the content that parents and teachers want to interact with. For example, in this study, both parents and teachers highlighted their wishes

to discuss the study-related matters, which previous studies have suggested can be recorded in time-efficient forms through DC (Graham-Clay, 2005), including videos and pictures. The overall conclusions of the study suggest that teachers need to be aware of the contents of DC when communicating with pupils' parents. Although DC is a channel for conveying specific information, it sometimes leads to misunderstandings of conflicts and classroom-management matters. More alternative channels, such as direct, face-to-face conversations, are still needed depending on the situation. In order to improve the effectiveness of PTPs, school involvement strategies need to balance traditional approaches with modern technology. They should also respond appropriately to specific situations and consider the views of the contents of DC.

5.4.3 Suggestions for Future Research

The current study's findings have yielded three directions for future research. First, can the findings apply to PTP and views of DC in different regions of China? 537 parents and 148 teachers were chosen as research subjects in this study. Those research objects came from first-tier or new first-tier Chinese cities with high levels of information technology penetration (EdTech Hub, 2020). Therefore, unlike the previous Finnish study, which compared participants from urban and rural areas (Kuusimäki et al., 2019), no significant differences between the selected Chinese regions have been dialogised. As a result, if future studies can avoid regional limitations, such as sampling parents and teachers from different cities, the reliability and validity of the results should improve.

Extending current research would be another important direction for future research. The impact and generalisation of the survey results are limited due to the small size and controlled grade levels in the current study. Extending the scope of education to high schools would aid in

the investigation of the external force of PTPs, including longitudinal effects. Simultaneously, large projects using random sampling methods will extend the findings to other scenarios, providing a more comprehensive approach to establishing PTP for caring students during adolescence. More qualitative research is required to identify how the PTPs should be implemented through DC. Since involvement and partnership were two of the primary criteria derived from DCS among parents and teachers, it is worth investigating what functions of DC tools or what sorts of technology-enhanced information constitute "high" involvement and "high" partnership.

Finally, more practical research is needed to determine how these findings can be applied in real-world engagement practices and how DC between parents and teachers can improve students' academic performance. If a special version of the student questionnaire can be designed to link the students' views and experiences to which parents and teachers correspond, the research results may reveal more characteristics and reinforce broader opinions. Furthermore, suppose the administrators can support the collection of students' academic data. In that case, this may provide direct evidence of the influence of PTPs on changes in students' academic performance as outcomes.

5.5 Conclusion

PTPs in China aim to align views between school and family through involvement practices, with their rights and responsibilities being more evenly distributed in the expanding electronic communication environment (Lareau, 1996). Therefore, the conceptual framework developed earlier in this thesis appears to describe this phenomenon adequately. The findings in this paper

are essential for practitioners who are about to incorporate DC into their practises, and researchers looking for 21st-century solutions to encourage parental involvement in the field of education. This study clarifies the relationship between effective DC and PTPs by integrating the four main DC factors. The PTP was beneficial in increasing parental involvement and establishing complete, consistent, and continuous support from both parents and teachers (Harris & Goodall, 2009).

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Appendix A: Information Sheet (Chinese version and English version)

数字通信在中国家校共育中的实施：教师和家长的观点

研究信息资料

你的学校被选为参于牛津大学硕士生的研究项目。我们迫切渴望负责主要教学的教师代表和学生家长同意并参与此项研究。这份研究信息资料将详细称述这项研究将如何进行，以及在参与过程中将涉及到什么信息内容。

这项研究的目的是什么?

本研究旨在探讨数字通讯工具在我国中学的应用前景及经验。本人希望对教师与家长之间的交流进行调查和文本分析，以便更好地对数字通讯反馈，以及更好地了解数字通讯工具在中学内部帮助家长和教师建立家校共育的伙伴关系。

为什么选择您的学校?

在信息技术飞速发展的今天，贵校的教师积极地运用数字通信技术、并融入到课堂和学校活动中，创造了形式多样的家校合教活动。贵校的家长积极配合老师合作和沟通，是建立高效的家校伙伴关系的典型代表。本人期待贵校教师和家长对数字信息管理的看法，以此来更好地了解在信息时代中，中国中学使用数字通信的现状。

研究期间会发生什么?

贵校的教师与家长将会收到并完成一份无记名在线调查。这份在线调查将会涉及的问题有：关于对电子成就反馈、家校合作关系以及更广泛的数字交流实践的看法。在教师与家长双方许可下，贵校班主任将提供 10 至 15 名学生的学习记录，这些记录将以电子格式化名收集，并将为家校共育是如何支持学生的学业成就提供证据。

此外本项研究还将进一步收集贵校教师与部分家长之间的音频记录作进一步分析，非文本形式的沟通内容将会被翻译、录入为以化名形式的文本格式。作为教师，您将阅读并签署一份知情同意书，这份知情同意书将概述调查的结构、以及收集的数据将被如何使用和存储的细节；作为家长，如果您不希望您本人或您的孩子参加上述的研究项目，您可以选择签署并返还一份电子版本的拒绝信。所有数据将以匿名或化名的形式，录入并保存于加密的电脑上文件夹中，仅供研究团队及授权人员查阅。

参与调查的必要性

本项研究欢迎所有参与者。本项研究并不存在已知的风险。参与这项研究，将有助于为贵校的教学管理提供有利的证据基础，帮助教师与家长加强运用数字通信和巩固家校伙伴关系的信心。您也将有机会为家校合作关系在中国的发展提供您的专业建议。论文完成后，本人将提供最终报告供贵校使用，并在论文致谢部分对贵校的参与表示最诚挚的感谢。

后续联系

如果您对本研究有任何疑问，请随时联系牛津大学研究员邵显清

邮箱：xianqing.shao@ssho.ox.ac.uk　　微信：LeannanS　　电话：+86 1377786225

The implementation of digital communication (DC) in parent-teacher partnership in China: teachers' and parents' views.

Research Study Information for teachers and parents

Your school has been chosen to take part in a research project conducted by a postgraduate from Oxford University. We are asking the teacher and parent representatives who represent the parent-teacher partnership in China for consent to take part in this study. This information sheet describes in detail how the study is being conducted and what your participation will involve.

What is the purpose of the research?
The purpose of this study is to explore the application prospect and experience of digital communication tools in secondary schools in China. I hope to undertake a survey and textual analysis of communications between teachers and parents, in order to gain a better understanding of the digital communication and the establishment of parent-teacher partnership within secondary schools.

Why has your school been chosen?
Nowadays, with the rapid development of information technology, teachers at your school are actively using digital communication tools. Many of them have the opportunity to integrate more usage of technology into the classroom and created diversified forms of family-school collaborating activities. Parents at your school are also actively cooperating with teachers, in terms of representing an efficient parent-teacher partnership. I am looking forward to understand the view of digital communication from the teachers' and parent' views of your school. In this way, we can better understand the current situation of the usage of digital communication in Chinese schooling at the information age.

What will happen during the study?
An anonymous online survey will be sent to teachers and parents of your school. The online survey will be asked some questions about views on technology-enhanced feedback, parent-teacher partnership, and broader practice of digital communication. With your administrative consent, your academic administrators will provide some academic records of individual students, which will be collected pseudonymously in electronic format. This data will provide evidence that feedbacks among parents and teachers in digital communication channels is important in fostering pupils' academic achievements.

In addition, this study will further collect audio recordings for further textual analysis. As a teacher, you will need to read and sign an informed consent if you wish to take participation. As a parent, if you do not wish yourself or your child to participate in the above study program, you may choose to sign and return an electronic version of the rejection letter. All data will be pseudonymously entered and stored in a password-protected folder on an encrypted laptop.

Do you have to take part? What are the risks and benefits of taking part?
We welcome all participants. There are no known risks to participating in the study. The possible benefits of taking part are helping to provide an evidence base of academical management for your school. It may also help with understanding and building a confidence relationship of teachers and parents at your school. You will also have an opportunity to provide suggestions for the further development of parent-teacher partnership in Chinese schooling. After submitting this paper, I will provide the final results for your school for future administering purposes. I would also like to express my sincere appreciation for your participation in the acknowledge part of the paper.

Contact for Further Information or Follow-up
Should you have any further questions about this research, please do not hesitate to contact Xianqing Shao, Xianqing.shao@ssho.ox.ac.uk, Department of Education, 15 Norham Gardens, Oxford, OX2 6PY.

Appendix B: Invitation Letter for Gatekeepers

DEPARTMENT OF EDUCATION



Xianqing (Lucy) Shao
MSc student
E-Mail: xianqing.shao@ssho.ox.ac.uk
http://www.education.ox.ac.uk/

The implementation of digital communication (DC) in parent-teacher partnership in China: teachers' and parents' views.

Ethics Approval Reference: [ED-CIA-21-127]

Dear Headteacher,

I am writing to enquire about conducting some research in your school in the next academic year. I am a master student at the University of Oxford, supervised by Professor Lars-Erik Malmberg. In my research study, implementation of digital communication (DC) in parent-teacher partnership in China, I will explore how are the qualities of digital communication between parents and teachers in China. To show that digital communication facilities parent-teacher collaboration. Furthermore, this research aims to provide evidence that technology-enhanced feedback is Important in fostering pupils' academic achievements.

The research will take place with classes in Grade 6-9. I am looking for teachers who are using digital tools to communication with parents. I am not aiming to change what or how the teacher chooses to teach, and will not be making any judgements about teaching. My research focus is on implementation of DC in parent-teacher partnership.

By participating in the research, your school would be contributing to research that will explore how DC facilities the parent-teacher partnership in China; and how is technology-enhanced feedback encouraging your pupils in their academic achievement.

The commitment from the school would be to allow me into access textual analysis of communications among teachers and parents in WeChat, and students' academic records over the course of two terms. I will transcript and translate the audio-records where teachers engaged in individual parents in WeChat. The academic records will focus on the report-card for anonymous students in your chosen class will not be seen by anyone else or used for research without further explicit permission.

Oxford University has strict ethical procedures on conducting ethical research with teachers and students, consistent with current British Educational Research Association guidelines. Before beginning the research, I would inform parents/guardians about the research and offer the students and parents/guardians the opportunity to refuse to participate. Throughout the research, students and parents/guardians will be able to refuse to participate at any time.

All participants, including students, teachers, and the school, would be made anonymous in all research reports. The data collected would be kept strictly confidential, available only to my supervisor and myself and not used other than specified without the further consent of all involved being obtained. All recordings would be destroyed at the end of the research period, and kept in locked conditions until then.

If your school would like to take part in the study, or you need more information about what is involved, please contact me. Whether or not you feel it would be appropriate for your school to participate, I would be grateful if you would complete the pro-forma below, and return it to me in reply email enclosed in this letter.

Thank you for your time and attention. I look forward to hearing from you.

Yours Sincerely,
Xianqing Shao

Appendix C: Consent Form for Teachers (Chinese version and English version)

DEPARTMENT OF EDUCATION牛津大学教育系
Department of Education, University of Oxford
15 Norham Gardens, Oxford OX2 6PY



Xianqing (Lucy) Shao 邵显清
MSc student 硕士学生
邮箱: xianqing.shao@ssho.ox.ac.uk

数字通信在中国家校共育中的实施：教师和家长的观点

中央大学科研伦理委员会（CUREC）批准编号: ED-CIA-21-127

教师知情同意书

1 本人已阅读并确认上述研究信息资料。我有机会考虑这些信息、提出问题，并得到了满意的回答。

2 我明白我是自愿参与的，我可以在任何时候自由退出，不需要提供任何理由也不会产生不良后果。

3 我明白在研究期间收集的数据可由研究团队及授权人员查阅，我允许这些个人查阅我提供的资料。

4 我知道这个项目已经通过了牛津大学中央大学研究伦理委员会的审查，并获得了伦理许可。

5 我了解谁将有权访问所本人提供的数据，数据将如何存储，以及在项目结束时数据将发生什么。

6 我明白这项研究将如何被撰写并发表。

7 我了解如何提出我的担忧或投诉。

8 如研究信息资料的详情所示，我同意并理解研究人员将观察我与家长的沟通方式及其他方面，并且已与研究人员讨论并同意。

9 我了解记录将如何被用于研究过程和成果。

10 我允许在研究成果中直接引用化名。

11 我同意参加这项研究。

_____	dd / mm / yyyy	_____
同意人姓名	日期（日/月/年）	同意人签字

DEPARTMENT OF EDUCATION

Xianqing (Lucy) Shao
MSc student
E-Mail: xianqing.shao@ssho.ox.ac.uk
http://www.education.ox.ac.uk/

CONSENT FORM FOR TEACHERS

Central University Research Ethics Committee (CUREC) Approval Reference: ED-CIA-21-127

The implementation of digital communication (DC) in parent-teacher partnership in China: teachers' and parents' views.

1	I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2	I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, and without any adverse consequences or penalty.
3	I understand that research data collected during the study may be looked at by authorised people outside the research team. I give permission for these individuals to access my data.
4	I understand that this project has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee.
5	I understand who access to personal data will have provided, how the data will be stored and what will happen to the data at the end of the project.
6	I understand how this research may be written up and published.
7	I understand how to raise a concern or make a complaint.
8	I understand that researchers will observe my conversation with parents and other aspects of my teaching, as detailed on the information sheet, and discussed and agreed with the researchers.
9	I understand how data being collected will be used in research outputs
10	I give permission to be quoted directly in research outputs against a pseudonym
11	I agree to take part in the study

	dd / mm / yyyy	
Name of person taking consent	Date	Signature

Appendix D: The CUREC Ethical Approval Notification

CUREC

Liam Gearon <liam.gearon@education.ox.ac.uk>
Mon 2/15/2021 4:12 PM
To: Xianqing Shao <xianqing.shao@ssho.ox.ac.uk>
Cc: Student CUREC <student.curec@education.ox.ac.uk>; Lars-Erik Malmberg lars-erik.malmberg@education.ox.ac.uk

Dear Lucy,

The implementation of digital communication (DC) in parent-teacher partnership in China: teachers' and parents' views

The above application has been considered on behalf of the Departmental Research Ethics Committee (DREC) in accordance with the procedures laid down by the University for ethical approval of all research involving human participants.

I am pleased to inform you that, on the basis of the information provided to DREC, the proposed research has been judged as meeting appropriate ethical standards, and accordingly, approval has been granted.

Please continue to follow all current guidance issued by CUREC during the pandemic, notably COVID-19: CUREC guidance on research involving human participants, https://researchsupport.admin.ox.ac.uk/governance/ethics/coronavirus

If relevant please also check the CUREC website for their best practice research guides, https://researchsupport.admin.ox.ac.uk/governance/ethics/resources/bpg

Good luck with your research study,

Keep well and safe,

Yours sincerely,

All good wishes,

Liam

Chair, DREC

Liam Francis Gearon, PhD, FHEA, FRSA, Docent

Senior Research Fellow, Harris Manchester College, University of Oxford
Associate Professor, Department of Education, University of Oxford
Conjoint Full Professor, Newcastle University, Australia
Docent, University of Helsinki, Finland
Extraordinary Professor, North-West University, South Africa
Visiting Professor, Irish Institute for Catholic Studies, MIC, Limerick, Ireland
Honorary Senior Research Fellow, School of Education, University of Birmingham

Appendix E: First Page of The Online Survey - Informed Consent (Chinese version and English version)

我有兴趣了解数字通信在中国家长与教师合作关系中的实施:教师和家长的观点。这个简短的调查包含关于您使用数字通信工具的经验的问题。请放心，您的回复将被完全保密。

这个调查将占用您 10 分钟之内的实践。您参与这项研究是自愿的。您有权在研究期间的任何时间以任何理由退出。在进行本次调查时，您了解所有收集的信息将被严格保密，任何数据仅用于研究目的。您的名字不会出现在任何与本研究有关的书面工作中。如果您想与本次研究的主要负责人联系讨论该研究，请发送邮件至 xianqing.shao@ssho.ox.ac.uk

通过点击下面的按钮，您承认您参加本次研究是自愿的，您的年龄在 18 岁或以上，并且您知道您可以选择在任何时候以任何理由终止参与本次研究。

请注意，本调查最好在笔记本电脑或台式机上完成。有些功能在移动设备上可能不太兼容。

- ○ 我同意，开始问卷调查
- ○ 我不同意

Start of Block: Informed Consent

I am interested in understanding the implementation of digital communication (DC) in parent-teacher partnership in China: teachers' and parents' views. This short survey contains questions about your experiences of using digital communication tools. Please be assured that your responses will be kept completely confidential.

The survey should take you less than 10 minutes to complete. Your participation in this research is voluntary. You have the right to withdraw at any point during the study, for any reason. By proceeding with this survey, you understand that all information collected will be treated in strict confidence, and any data will be used solely for research purposes. You will not be named in any written work arising from this study. If you would like to contact the Principal Investigator in the study to discuss this research, please email Xianqing Shao at xianqing.shao@ssho.ox.ac.uk

By clicking the button below, you acknowledge that your participation in the study is voluntary, you are 18 years of age or older, and that you are aware that you may choose to terminate your participation in the study at any time and for any reason.

Please note that this survey will be best displayed on a laptop or desktop computer. Some features may be less compatible for use on a mobile device.

- ○ I consent, begin the study
- ○ I do not wish to participate

End of Block: Informed Consent

Appendix F: Participants' attitudes towards DC

	Parents N = 531 n (%)	Teachers N = 147 n (%)
Attitude to DC		
Neutral	180(33.9)	89(60.5)
Positive	314(59.1)	40(27.2)
Negative	37(7.0)	18(12.2)

Appendix G: Rotated factor structure of the DCS for separate parents' and teachers' dataset

Item	Factor loading			
	Factor 1: Partnership Parents/teachers	Factor 2: Encouraging feedback Parents/teachers	Factor 3: Unclear communication Parents/teachers	Communality Parents/teachers
1. Digital communication support trust-building between parents and teacher[2]	0.89/0.87			0.76/0.70
2. I can support teachers' educational work/ parents' educational work with my digital communication[2]	0.87/0.89			0.68/0.75
3. Digital communication encourages me to actively talk about my child's studies/…My pupils' studies[2]	0.80/0.81		-0.84/	0.65/0.64
4. Digital communication encourages me to actively involved in school activities/…Encourages parents to actively involved in school activities[2]	0.72/0.79			0.61/0.61
5.Ddigital communication supports educational partnership[2]	0.64/0.64			0.67/0.76
6. Digital communication supports the feeling that I am heard when speaking about my child's studies/… When I am informing parents[2]	0.58/0.75			0.67/0.76
7. Teachers' digital communication is encouraging to my child's overall development /My digital communication is encouraging to pupils' overall development[2]	0.43/0.72			0.56/0.72
8. I would like my child's conflicts to be communicated through DC than other methods/It is better to inform parents about pupils' conflicts via DC than other methods[3]	0.42/0.89			0.40/0.28
9. I receive various kinds of information about my child's studies/I can give various kinds of information about my pupils' studies[1]		-0.80/	/0.88	0.66/0.67

10. I get enough information about my child's strengths/I can give sufficient information to parents about the pupils' strengths[1]		-0.74/-0.81	0.68/	0.72/0.70
11. I get enough information about my child's improvements in grades/I can give sufficient information about my pupils' improvements in grades[1]		-0.67/-0.83		0.66/0.72
12. I get enough information about happenings in the classroom/I can give sufficient information about happenings in the classroom[1]			-0.83/0.76	0.70/0.62
13. Network platform has increased the frequency of my communication with teachers/parents[1]			-0.70/0.83	0.56/0.64
14. Digital communication involves misunderstandings with teachers/parents[3]				0.35/0.30
15. School sends overlapping digital messages[3]				0.30/0.32
16. All teachers of my child/all parents at my class have adopted compound (similar) way to communicate with me digitally[3]				0.25/0.21
Eigenvalue	8.88/6.50	1.92/1.90	1.44/1.60	
% Of total variance	42.27/38.21	9.13/11.19	6.85/9.39	
Total variance				58.25%/58.79%

[1]Epstein's dimension clarity and readability of digital communication (Table 2). [2]Epstein's dimension informativity, frequency, and effectivity of digital communication. [3]Epstein's dimension quality of digital communication.