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Chinese Pre-Service Science Teachers' Cross-Cultural Experiences in Canada:

A Narrative Inquiry

By

Chunlei Liu

A Thesis

Submitted to the Faculty of Graduate Studies
through the Faculty of Education
in Partial Fulfillment of the Requirements for
the Degree of Master of Education
at the University of Windsor

Windsor, Ontario, Canada

2019

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Chinese Pre-Service Science Teachers' Cross-Cultural Experiences in Canada:

A Narrative Inquiry

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ABSTRACT

To remain competitive in an increasingly global market, particularly with regard to science, Chinese universities increasingly engage in student-exchange programs to learn from Western pedagogical methods. Transformative learning is an ideal approach to maximize such exchanges; however, research on this topic is sparse. Thus, the current study conducted a narrative inquiry involving four Chinese pre-service science teachers, collecting data with the use of field notes, personal journals, and interviews. Results suggest that key barriers included culture shock, isolation, language barriers, undeveloped time-management skills, and limited understanding of Western pedagogical models. Based on these findings, the current study recommends that to maximize the benefits of cultural exchanges, it is critical to ensure students understand the nuances of time management and the transformative learning process so as to maximize their time and critical engagement while abroad. It is likewise recommended that—prior to departure—students learn about Western pedagogical models and struggles related to culture shock. It is also suggested that host schools make continued efforts to facilitate the students' engagement and offer mental health support throughout the exchange.

Keywords: science teacher candidates, reciprocal learning, cross-culture, narrative inquiry.

DEDICATION

To myself.

To my parents.

To my participants.

To all my fellow Chinese international students who supported me during my
academic studies.

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My first and sincerest thanks go to Dr. Zhou, my supervisor. Without his concern and continued support during my studies and daily life, I would not have been able to start and finish my thesis. I have been fortunate to have him as my supervisor because he has provided me with the most optimal research resources by working with the faculty members and colleagues in the Reciprocal Learning Program. I would also like to extend my thanks to Dr. Xu, whose guidance and leadership and helped to make the Reciprocal Learning Program an enriching opportunity to pre-service teacher and researchers alike.

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TABLE OF CONTENTS

DECLARATION OF ORIGINALITY	iii
ABSTRACT.....	iv
DEDICATION.....	v
ACKNOWLEDGEMENTS.....	vi
LIST OF TABLES.....	vii
LIST OF APPENDICES.....	x
CHAPTER 1 INTRODUCTION	1
International exchange programs	1
The reciprocal learning program.....	1
Purpose of the study	3
Significance of the study.....	3
Situating the Researcher.....	4
CHAPTER 2 LITERATURE REVIEW	7
The significance of cross-cultural experience.....	7
Multicultural education in China.....	9
Homogenous education in China	11
Teacher centred learning in China	12
Teacher education study-abroad programs	16
The significance of international interships to teacher candidates.....	18
Long- term and short-term exchanges.....	20
The importance of transformative learning.....	23
CHAPTER 3 METHODOLOGY	32
Research design.....	32
Participants	33

Data collection.....	34
Data analysis	38
CHAPTER 4 FINDINGS.....	41
High school experience in China	41
Education for all vs. education for you	47
Experience and Challenges in Exchange from China to Canada	48
School differences between China and Canada	52
Changing perspective about science education	56
CHAPTER 5 DISCUSSION, CONCLUSIONS, AND IMPLICATIONS.....	66
Discussion	69
Conclusions	80
Implications	81
Final Thoughts	92
REFERENCES	95
APPENDICES	109
Appendix A	109
Appendix B	110
VITA AUCTORIS	113

LIST OF TABLES

Table 1: Primary school	53
Table 2: High school.....	53
Table 3: Differences in science education	54

LIST OF APPENDICES

Appendix A: Reflective Journal Outline..... 109
Appendix B: Interview Questions..... 110

CHAPTER 1 INTRODUCTION

International Exchange Programs

International exchange and training programs play an integral role in developing international cooperation among educators in different countries (Altbach & Knight, 2007). An increasing number of teachers and school administrators are involved in exchange programs and implement new courses and teaching practices in their institutions. According to Trice (2003), these international exchange programs offer two key benefits: they provide insights into different pedagogies while providing supplemental education, and they provide students who may not be able to afford international education with an opportunity to gain the benefits of an international experience. In addition, participation in international courses can significantly affect educators' teaching practices, expand the scope of teaching methods, make curriculum alumni more culturally sensitive and insightful, and influence their interpersonal relationships, career development, and social status in school. These can be motivating factors that encourage participants to enroll in cross-cultural exchange programs and compel educators and educational institutions to develop and organize such programs.

The Reciprocal Learning Program

The Reciprocal Learning Program (RLP) offers an ideal example of an international exchange program. The RLP involves two tertiary schools—one from Chongqing in China, and another from Windsor, Ontario, Canada. Each year, Southwest University of China sends students to the University of Windsor, where they spend three months observing Canadian elementary and secondary schools. According to Connelly

and Xu (2015), reciprocal learning is a guiding term for mutual learning projects, and the RLP plays a critical role in the Canadian Social Science and Humanities Research Council (SSHRC) program between Canada and China. They define reciprocal learning as two or more people who learn from, appreciate, understand, and respect each other: the relationship between Canadian and Chinese education symbolizes this social relationship of equal education (Connelly & Xu, 2015). Mutual learning refers to building a bridge between the East and the West through cross-cultural narrative (Hao & Xu, 2013). In an ever-changing global world, teachers play an important role in creating a successful future for individuals and society (Xu, 2013). Different work teams, scattered around the world and linked by technology, are becoming the norm in the 21st century (Trilling & Fadel, 2009). This is supported by Nodding (2005), who found that in order for students to have rich educational experiences that enable them to become active citizens of a democratic society, it is important to challenge teachers with a global mindset. This will enable them to prepare inclusive courses for students with different cultural backgrounds. Darling-Hammond (2008) likewise argues that it is necessary for teacher education programs to understand how faculty candidates view the world around them so that they can learn more global teaching perspectives. Teacher candidates participating in a multicultural education program hope to develop an open, curious, and creative generation of young students (Xu & Connelly, 2010). This embraces the notion that teachers are the model of a new generation and the future builders of society. In this context, it is vital that Chinese teachers begin to understand, develop, and incorporate more diverse pedagogical models so as to promote critical thinking among Chinese math and science students.

Purpose of the Study

The current study will conduct a narrative discussion of Chinese science teacher candidates' cross-cultural knowledge in order to develop a thorough understanding of their experiences with international exchange programs and facilitate the process of mutual learning. The study likewise seeks to determine how participation in the RLP shapes the way they perceive science teaching. Two research questions guided the study:

1. What cross-cultural experiences and challenges do Chinese exchange students encounter in the RLP?
2. How does participation in this program influence their perceptions about science teaching?

Significance of the Study

This study can provide insights needed to help make international exchanges more meaningful and facilitate teacher candidates' professional cross-cultural growth, which they can apply in science teaching. The findings also have the potential to contribute to the overall goal of the SSHRC collaborative project while providing valuable insights to Chinese science teacher candidates who are interested in improving cross-cultural experience and awareness. These findings may also be beneficial to future teachers and teacher candidates who are interested in participating in international exchange programs, as well as program coordinators who seek to enrich the teacher education programs. In addition, the success of such programs has the potential to increase the cultural perspectives of Chinese science courses.

Previous research demonstrates that exchange programs help students “become more culturally sensitive and more reflective of their own cultural traditions and

educational practices” (Howe & Xu, 2013, p. 38) but that most teacher candidates do not have the opportunity to immerse themselves in language and customs of other countries (Xu, 2011). Thus, to maximize the benefits of such programs, it is critical to understand the barriers the participants of exchange programs experience and which elements promote learning. Thus, the current study seeks to identify these elements so as to ensure that programs and students can maximize the benefits of international exchange programs.

Situating the Researcher

As a Chinese international student studying in Canada, I have seen the limitations of China’s current pedagogical models firsthand. Though the Chinese education system has instilled in me a broad base of knowledge and extensive theoretical foundation, and taught me the value of diligence and dedication to my studies, I am not as competitive with respect to creative engagement as some of my Canadian peers. Reflecting on my experience in the Chinese education system has underscored the need for the current research.

Though the Chinese government recognizes the importance of critical thinking, the prioritization of standardized testing in China prevents the education system from effectively implementing critical-thinking strategies in schools. For example, when I was in high-school chemistry class, we sometimes engaged in experiments, which facilitated my understanding of the subject. However, while Canadian classrooms might conduct such experiments once or twice a week, our class size and the focus on learning content for university entrance examinations prevented us from engaging in this kind of kinesthetic learning more than once a month. Even when we did, we might only get a

chance to watch the teacher perform the experiment and not get to practice it ourselves. Though teachers recognized the value of experiments, we had limited time to conduct experiments in class, which limited our critical engagement.

Chinese high schools primarily use teacher-centred approaches and exam-orientated assessment. Like many students, I spent my days at school sitting behind a desk, listening to my teachers, and furiously writing down every word they said while trying to simultaneously commit their lesson content to memory. I would then write test after test in order to demonstrate I had learned the content and could repeat it. This rote learning may sound boring, but as a graduate student in Canada, it has provided me with a high level of understanding, made me a self-motivated and diligent student, and provided me with an extensive and profound understanding of education theory. However, my creative and critical engagement is not as refined as that of my Canadian peers, and this is a problem I see among many of my fellow international students from China.

Though my peers and I are aware of this issue, it does not mean that we know how to solve the problem. To do that, we must determine the reason for our limited creative and critical engagement. My cognitive process is trapped in an invisible framework because I have always been prepared to choose a “quick and correct” way of learning, initially introduced by my teacher, and later developed into my own thinking over time. This critical response is stunted by another strange phenomenon engrained in Chinese culture: the belief that the content written in the textbook and the content taught by the teacher represent unassailable authority. This, as I now know, is a ridiculous fallacy. However, having come from a system where students are expected to learn and

master “science and truth,” it is easy to accept this. In this system, we are taught to ask “what,” “when,” “where,” and “who,” but not “why” or “how.” Without these more critical questions, it is still doubtful that what we have learned with the label of “science and truth” is correct.

The focus of this educational strategy is to show us the realism and objectivity of knowledge, but it does not teach us how to think critically about why and how things work. Therefore, our creativity and critical thinking are suppressed, even though the most important task in education is to develop students’ critical thinking. It is one of the most important psychological characteristics because it inspires creativity.

CHAPTER 2

LITERATURE REVIEW

Before exploring the Southwestern University of China and the University of Windsor's Reciprocal Learning Program, it is critical to develop an understanding of how these programs function as well as their benefits and limitations. This requires understanding the significance of cross-cultural experiences and the development of cross-cultural concepts and cross-cultural connotations of pre-service teacher education. It is also important to examine multicultural education and the significance of teacher-education study-abroad programs, as well as how international practicums influence and shape the experiences of teacher candidates.

The Significance of Cross-Cultural Experiences

Cross-cultural experiences are valuable learning experiences that situate students in an environment where learning occurs through positive interactions with different cultures (Robertson, Line, Jones, & Thomas, 2000). As a Chinese proverb suggests, "It is better to walk thousands of miles than to read thousands of books." Immersion in different cultural environments through cross-cultural travel is an effective way to gain cross-cultural experience and understanding. According to Xu (2011), this can be facilitated in Canada's rapidly changing cultural mosaic, which enables people to travel and immerse themselves in a unique, multicultural environment.

According to Sharma (2011), pre-service teachers do not question their knowledge, beliefs, attitudes, and opinions about themselves and different cultural groups. Relatedly, Xu (2013) says that in this ever-changing global world, teachers should do something to prepare their students for a changing society; however, if even

the teachers have not experienced the collision of different cultures, how can they communicate this knowledge to their students?

Moreover, in recent years, the voices that require teachers to think on a global scale are getting louder, and many colleges and universities have invested in study-abroad programs (Altbach & Knight, 2007). China attaches great importance to the development of science and has sent teachers to countries with higher technological development levels, such as Germany, to learn (Ackers, 2005). The teachers returned home and taught their students what they had learned abroad. Therefore, in recent years, student exchange programs have received great attention, especially in the training of teacher candidates. According to Wang (2015), through the RLP, Chinese teacher candidates from Southwestern University are placed in a purely Western social and cultural environment, which is completely different from China's situation. Through cross-cultural visits, Chinese teacher candidates will cross different race and cultural boundaries. This is to help teacher candidates develop a cross-cultural ability to enable them to interact effectively. In the future, these highly skilled teachers can pass on global knowledge to the new generation (McAllister & Irving, 2000). This is important because international education standards are increasingly prioritizing the qualifications of teachers (Unlu, 2015). Therefore, it is important to value and promote opportunities for cross-cultural experiences in pre-service teacher education programs as they enhance teachers' abilities to meet needs of multicultural education, which is necessary to enhance cross-cultural understanding in pre-service teacher education programs. This will improve the teacher candidates' personal and professional multicultural competence in accordance with multicultural educational beliefs. Thus, it is important to create a teacher

training process that provides teacher candidates with the skills required to navigate multicultural environments (Unlu, 2015).

Multicultural Education in Canada

Because Canada is a multicultural country, it provides an ideal setting for pre-service teachers who seek to learn how to navigate and thrive in multicultural environments. There is significant literature on Canada's multicultural education and national teacher education programs that confirm the value of multicultural education in Canada. According to the Montgomery (2005), Canada officially became a multicultural country in 1971, at which time the government began to recognize the values and dignity of all races, nations, languages, and religions. This has encouraged people to accept and encourage many cultures, which have in turn thrived in Canada, allowing multiculturalism to flourish (Montgomery, 2005). As a result, Canada has become a diverse society with immigrants from around the world. Moreover, multiculturalism and pluralist cultural education have been highlighted in teacher education programs (Hao & Xu, 2013), which prepare teachers to accommodate the needs of their increasingly multicultural classrooms.

Gay (2002) argues that because multiculturalism and pluralist cultural education are valuable, teachers should be provided with incentives to carry out culturally inclusive and responsive teaching, and that such pedagogies should be a mandatory component of teacher training. It is considered important for teacher candidates to develop multicultural competencies, such as the ability to question their thoughts, attitudes, and perceptions, and to identify various cultural backgrounds (Keengwe, 2010). In order to advance multicultural education development, it is necessary to provide teacher candidates with

opportunities to travel overseas to gain personal and professional cross-cultural experiences as this can provide them with a first-hand understanding of the values of multicultural approaches. This can be extremely valuable in developing multiculturalism in both school education and teacher education programs. The Reciprocal Learning Program can offer rich cross-cultural experiences that expose Chinese science teacher candidates to diverse classrooms in the Canadian context.

The importance of multiculturalism in Canada is evident in the classroom (Mujawarnariya & Mahrouse, 2004). Overviews of the multicultural education in Canada show that the official acknowledgment of the needs of students from diverse backgrounds can indeed be traced back to the federal policy on multiculturalism, promoting a different but equal approach to be adopted in schools (Mujawarnariya & Mahrouse, 2004). As to its application, it is necessary for teacher education programs to “understand how students view the world around them to be able to best prepare them to teach with this global teaching perspective” (McGaha & Lindr, 2014, p. 305). A number of studies show that teacher education programs in Canada pay increasing attention to multicultural courses or diverse cultural curricula. It is through the diverse multicultural curricula in teacher education programs that allow teacher candidates to “explore the processes of knowledge production that sustain the power of certain groups over others” (Mujawarnariva & Mahrouse, 2004, p. 4). To this end, if Chinese science pre-service teachers can come to Canada, it is essential that teachers are able to teach effectively with a global perspective in a world characterized by interconnections and interdependence (McGaha & Linder, 2014). This is in accordance with the belief held by Mujawarnariva and Mahrouse (2004) that “it is only when teacher candidates become aware of such

issues of multicultural power that we can expect our education system to become equitable” (p. 5).

Homogenous Education in China

In contrast to Canada’s multicultural learning environment, China’s schools are overwhelmingly homogenous in many respects. There are numerous studies that demonstrate the homogeneous nature of China’s teaching environment. The Chinese government encourages people to accept a unified basic education. This approach has been endorsed by the Chinese people because of the large number of different populations within the country. According to *National Minorities Policy and Its Practice in China* (1999), there are 56 ethnic groups in China, and the cultural background of each ethnic group is different. Unified basic education flourished in the 21st century as it is not feasible to have 56 different methods of teaching to suit different populations. As a result, China has become a homogenous society. In addition, the teacher education program highlights homogenization and homogeneous education, enabling teachers to adapt to China’s current situation at this stage.

Although there are advantages to this approach, research has outlined the drawbacks of homogenous education, which has fostered the introduction of many cross-cultural education activities in China. According to Ford (2011), multiculturalism and multicultural education are valuable and can provide incentives for teachers to engage in culturally inclusive and reactive teaching, and such teaching methods can be an integral part of teacher training. It is critical for teacher candidates to develop multicultural abilities, such as being able to be critically self-aware of and question their thoughts, attitudes, and perceptions, and to identify cultural contexts. In order to promote the

development of multicultural education, it is necessary to provide teachers candidates with opportunities to travel abroad and to gain personal and professional cross-cultural experiences (Willard-Holt, 2001). This provides pre-service teachers with a first-hand understanding of the value of multicultural approaches and is essential for developing multiculturalism in school education and teacher education programs. According to Huang (2017), the RLP facilitates this as it provides a rich cross-cultural experience that allows Chinese science teacher candidates to reach out to different classrooms in a Canadian context.

China's homogeneity is evident in the classroom. An overview of China's homogenous education shows that, given China's immense population, it is currently an ideal method of education as it is the most efficient way to cultivate the specific skills and talents needed for China's immediate nation building needs. As for its application, China's teacher education program is also based on homogenous education. However, globalization and development has encouraged people to realize that they must understand how students perceive the world around them and to integrate a global teaching perspective into their pedagogical approach. Research has shown that Chinese teacher education programs are increasingly focused on multicultural programs (Banks, 2015). Thus, Chinese pre-service teachers come to Canada to learn how to effectively teach from a global perspective so that their students will be prepared to succeed in a world characterized by interdependence (McGaha & Linder, 2014).

Teacher-Centred Learning in China

Unlike many Western schools, China's classrooms rely heavily on the Confucian, teacher-centred model. This is primarily because the limited resources allocated to

China's education are not sufficient to provide China's large population with more comprehensive and inclusive student-centred pedagogies. Moreover, China's teachers are required to cover an immense amount of material outlined in the curriculum. As a result, teachers are under significant time constraints and do not have time to field questions from the 50-70 students they have in each class, and neither do they have time to incorporate group activities. Thus, teachers exclude these student-centred approaches in favour of teacher-centred approaches, such as extensive lecturing. This reliance on auditory learning is efficient enough to satisfy the needs of most students in large classes; however, it does not provide auditory and kinesthetic students with learning opportunities that support their learning preferences. Consequently, these students are often left behind.

Teachers also struggle with limited funding and resources. The equipment used for group activities can be expensive. For example, a biology lab in a Chinese classroom is impractical for a class of 70 students. In a Canadian context, classrooms of 30 or fewer need no more than 15 student work stations with sinks. In a Chinese classroom, however, as many as 40 student work stations would be required, and as many Bunsen burners, microscopes, and other pieces of equipment. Moreover, the amount of chemicals being used would be significantly higher. Without these resources, teachers in China must rely almost exclusively on instruction.

Though limited in some respects, teacher-centered pedagogies have several advantages. For example, Gerber, Cavallo, and Marek (2001) note that the long-term existence of the teacher-centred teaching model has four central advantages: (1) the teaching efficiency is intuitive and efficient; (2) it is conducive to giving play to the leading role of teachers and allows teachers to organize and monitor the classroom

activities; (3) it is conducive to teacher-student interaction and promotes emotional exchange; and (4) it is conducive to imparting systematic scientific knowledge and forming a complete knowledge system. People who advocate for the use of the teacher-centred approach believe that it is the best strategy for basic skills teaching. Therefore, basic skills—such as grammar rules, multiplication, and scientific data—can be taught directly by the teacher (Devi & Deedi, 2015).

However, there are two key disadvantages to a teacher-centred approach: (1) students who are the subject of learning lose their initiative in learning as teachers dominate the entire learning process; and (2) teacher-centred approaches are not conducive to promoting creative and applied talents or encouraging innovative thinking. Because most of the students trained in this mode of teaching are knowledge-based and speculative talents, they may lack the creative and applied talents required in social and professional contexts (Baeten, Kyndt, Struyven, & Dochy, 2010).

Though China's teacher-centred education model is in line with China's national conditions, Martin, Wang, and Ma (2015) suggest that it has certain limitations. For example, they note that it does not incorporate teaching approaches that accommodate visual and kinesthetic learners, which in turn causes many of them to fall behind in class. In a teacher-centred classroom, teachers use a systematic approach to plan and provide informative courses to students who passively receive information. Almost exclusively focused on teachers, this approach requires limited classroom resources and student involvement. This teacher-led method is favoured by most schools in China. In this approach, the professional knowledge of teachers makes the teacher the centre of the classroom and gives them a higher status than students. Thus, the teacher becomes an

authority figure and the only source of knowledge on a particular subject, and the primary way in which they convey this knowledge is through lectures, a key element of auditory learning. China's pedagogical model is based on the belief that students learn best through memory repetition and information provided by notes. Thus, a student-filled classroom listens to lectures and takes notes, and this scene represents classrooms across China, from elementary school to university. The notes students take and use to study are dependent on how effectively they take notes, and if they are not auditory learners, their note taking may not be thorough. As a result, even if auditory and kinesthetic learners put in extra effort, the resources they are using to study are limited. Thus, in this mode of teaching, visual and kinesthetic learners find it difficult to learn.

According to Brandl (2002), in contrast, the Chinese education system is predicated on reasoning that frames teacher-centred approaches as ideal. China has decided that excellence in math and science are a priority and that the most effective way to evaluate this is through exam-orientated assessment. To achieve high marks on such assessments, students must acquire a significant amount of information in a relatively short space of time. Developing effective recall and memorization skills are the most effective way to succeed on such test. To achieve this with the limited resources they have and the immense number of students they serve, China's education administrators have determined that the most effective way to develop recall skills and memory is through direct guidance: teacher-centred learning. Consequently, students passively receive information from teachers and seldom participate in group activities or challenge the information provided. Thus, students have little opportunity to develop skills that seem important in the West.

In contrast, Feist and Reid (2018) observe that Canada has been trying to eliminate or transition away from a teacher-centered approach in favor of a student-centered approach. Teachers do not act as authoritative figures; rather, they play the role of “promoter” to guide students through the learning process. Western teaching methods treat students as contributors rather than recipients and focus on group interaction. Students are key players in the learning process and are encouraged to ask questions and challenge ideas and concepts. Although the success of the exam is still important, the approach is more focused on understanding and developing creative and critical thinking skills. As a result, student-centered activities are more varied, involving group discussions, problem solving, and unconventional thinking. This approach provides students with knowledge and skills that are useful in both academic and non-academic settings.

To offset the limitations inherent in China’s teacher-centered pedagogical model, pre-service science teachers can learn about Western pedagogical models through exchange program and import these models when they return to China, incorporating them into China’s education system.

Teacher Education Study-Abroad Programs

One of the most effective ways to challenge the cultural biases that shape the pedagogical values of China’s preservice teachers is to place them in a Western learning environment that will challenge their preconceptions. According to Garmon (2005), intercultural experiences may be beneficial to the future teaching career of teacher candidates, and these experiences have the potential to facilitate the development of teacher education. In addition, these programs give pre-service teacher candidates the

tools to create generations of open, curious, and creative young people (Xu & Connelly, 2010). Educators can reflect on their experiences and new ideas and how to translate these ideas into powerful curriculum programs through this reflective process (Connelly & Crandin, 1988). Bennett (1993) notes that in order to be effective for different students in a global context, it is crucial that schools encourage and support teacher candidates with cross-cultural experiences and ideas and understand teachers' worldview. This can satisfy the development of teacher education in a multicultural society. In this way, multicultural and inclusive ideas make a significant contribution to the academic and professional development of teacher candidates.

Given the rapid growth of study abroad programs, Byram and Feng (2006) state that "travel becomes part of the lives of many young people of university age, and of the majority of those living in developed and wealthy countries" (p. 1). This makes cross-cultural experience easier to acquire for Chinese students. As a result, Chinese universities have increased the number of study-abroad opportunities for students, and this increase is based on the perception of beneficial academic, personal, and career outcomes coming from the study-abroad programs (Shougee, 1999). While most literature related to cross-cultural experience generally deals with the experience of longer stays abroad, the "growing popularity of programs that involves shorter stays has been ignored" by some researchers (Jackson, 2006, p. 134). Admittedly, "year-around cross-cultural visiting and experience may provide further evidence of gains in terms of cognitive and affective development and intercultural skills" (Byram & Feng, 2006, p. 4). However, the gains of short stays could be further enhanced with appropriate cross-cultural communication and pedagogical interventions. Byram and Feng (2006) believe

that those who participate in intercultural visits are more likely to experience significant change and receive a stronger and richer educational experience than those who remain in their own country.

The impact of study-abroad programs shows a deeper understanding of the role of diverse cultures and the different languages of teaching and learning. After studying abroad, teacher candidates were more willing to work in diverse classrooms. That is to say, after having experiences in two countries—Canada and China—with two distinctive educational systems, Chinese teacher candidates may expand their understanding of pedagogy by reflecting on their cross-cultural experiences. Some studies have found that studying abroad fosters greater confidence, open-mindedness, and an ability to see the local and global in context, which evokes self-critique and critical reflection (Cushner & Mahon, 2009). Therefore, it is safe to conclude that cross-cultural experience is essential and important to teacher candidates within the context of globalization.

The Significance of International Internships to Teacher Candidates

International teaching experience has also been found to increase tolerance and respect for others while contributing to personal development (Byram, Gribkova, & Starkey, 2002). These experiences provide opportunities for teachers to deepen their understanding and reflection of the world and to share global ideas among teacher candidates, which is critical as teacher candidates need to be aware of what they are doing in different contexts (Byram et al., 2002).

Due to the different cultural backgrounds, teaching internships in China are different from those in Western countries such as Canada. According to Hynie, Jensen, Johnny, Wedlock, and Phipps (2011), teaching internships in Canada encourage students

to recognize the entire world community and foster a desire for diversity in personal relationships. The teaching internship in China is intended to provide students with the opportunity to engage in practice teaching, test their professional knowledge and teaching skills, and identify their own problems. In contrast, China's teaching practice lacks a sense of world identity, and in order to correct this, China is now actively promoting the international teaching internship program. According to Mayn (2012), many international teaching programs have consistently set the same goal: transforming teacher candidates' understanding and pedagogical approaches by increasing exposure to other cultures. After gaining international teaching experience, teacher candidates should be better able to work in multicultural classrooms (Sleeter, 2001).

Cross-cultural experiences allow teacher candidates to learn deeply about a culture through immersion in an international practicum that includes significant, direct, and personal interaction within the culture (Brislin & Cushner, 1996; Maynes et al., 2012). Researchers have identified this outcome as a result of international teacher candidates' experiences abroad. According to Maynes (2012), goals such as intensifying the world's horizons, enhancing the world's perceptions, and better classroom teaching after returning home are the common outcomes of such programs. The teaching cohort in most countries is comprised of a majority of candidates from the dominant culture. Maynes (2012) observes that the candidates provide the pedagogical practices that have been developed based on their cultural beliefs and learning experiences. The international practicum offered by the RLP provides an opportunity to increase exposure to a different and diverse teaching environment. As

such, it can help Chinese teacher candidates acquire strengths from both systems, which they can then use in their future classrooms in China.

Long- Term and Short-Term Exchanges

Though exchange program can enhance pre-service teachers' strength, the degree of a programs' success can be either restricted or improved by the duration of the exchange. Compared to programs like the RLP, 3-6-week exchanges can be framed as short-term. Thus, programs that can be counted in months rather than weeks are often viewed as long-term exchanges. Evidence suggests that students are more likely to see the benefits of meaningful and lasting transformative learning from long-term exchange programs. For example, Dwyer (2004) argues that students who study abroad for longer periods of time are more likely to see significant personal, academic, and cultural growth. Thus, it is essential to recognize that short- and long-term exchanges are fundamentally different.

Short-term exchanges. The prevalence of short-term exchanges is largely due to economic and scheduling pragmatics. Students often take short exchange programs because programs do not operate as part of their regular course work. Therefore, they must do the exchanges in between semesters or in the summer. Moreover, their programs may be intensive and going away on long-term exchanges will require them to extend their period of study or miss out on co-op/experiential learning opportunities, which may interfere with life plans. The cost of such exchanges is also a factor as the expenses associated with long-term exchanges may be too much of a financial burden for most students.

Students in short-term exchanges often have less time to critically process and absorb the cultural lessons that are often the primary purpose of such exchanges. According to Yeh and Inose (2003), many students go to North America to participate in the exchange program so as to advance their English, but in a short-term exchange program, their English does not usually see significant development. In addition, it is difficult to achieve improved language skills in short periods of time, which may make communication between participants and local students more challenging. Without meaningful interactions with students from the host culture, the level of engagement simply will not be intense enough to allow for meaningful learning experiences. Moreover, due to time constraints, supervision is often less comprehensive (Yeh & Inose, 2003); therefore, students may not be given that kind of thorough and in-depth guidance required to engage in critical reflection or advance to the level of transformative learning. Neither are they likely to have time to engage the extensive critical discussions required to facilitate such learning.

Another issue is the cultural shock and homesickness associated with short-term exchanges. These problems are difficult to overcome in just a few weeks and can overwhelm students. While students on long-term exchanges encounter the same problems, they have more time to overcome them, and thus, more time to be comfortably immersed in and engaged with their host environment. For those on a short-term exchange, however, they may not be able to overcome these challenges in the time they are there and thus will be unable to participate in any meaningful level of immersion into the host culture. Moreover, because the exchange is shorter, they may not be motivated to overcome the issues associated with cultural shocks and homesickness. Thus, the

participant may not experience meaningful and lasting transformative learning or cultural engagement.

In these kinds of programs, students do not often prioritize the transformative nature of the learning. For example, Behnke, Seo, and Miller (2014) examined the project evaluation of 11 undergraduate study abroad programs covering 9 years. A total of 185 participants completed the survey using an assessment designed to improve the program, which was collected at the end of each experience. The data was examined using a hybrid approach to determine program characteristics that contribute to student satisfaction, and the results suggest that student preferences are prioritized in terms of logistics, culture and pleasure rather than transformative learning. Thus, their learning may not be transformative.

Long-term exchanges. In contrast, long-term exchange programs facilitate more meaning learning and deeper and more transformative learning (Einfeld & Collins, 2008). Those in long-term placements become immersed in the host cultures because these exchanges are more like being immersed in a new living environment that promotes extended learning. As a result, long-term exchange students often have ample time to critically process and absorb cultural courses, which are often the primary purpose of such communication. In addition, because of the length of time, supervision tends to be more comprehensive (Messer & Wolter, 2007); therefore, students have the opportunity to gain the comprehensive and in-depth guidance needed to critically reflect or advance to a transformative level of learning. They also have more time to participate in a wide range of critical discussions during their exchange. For example, according to Yeh and Inose (2003), many students go to North America to participate in exchange programs to

improve their English. Therefore, in the long-term communication program, these students are more likely to see significant development in their English language skills.

According to Furnham (2002), as in short-term exchanges, students in long-term exchanges may experience culture shock and homesickness. Although these problems may be accompanied by the entire exchange process of the students, these students have more time to adapt to the culture shock and get over their homesickness than those on short-term exchanges. Therefore, there is more time to comfortably immerse and interact with their host environment. Therefore, they will be more likely to experience meaningful and lasting transformational learning or cultural participation. However, for students that cannot overcome culture shock or homesickness, these long-term exchanges may prove even more challenging (Andrade, 2006).

One of the reasons students may be reluctant to participate in a long-term exchange is the cost and time away from school; however, universities can address this concern through a couple of different approaches. For example, the RLP includes the long-term exchange program as part of their university curriculum, so the time in the program counts towards their credits. This encourages students to take this exchange experience seriously; however, cost is remaining a concern as students must pay for travel expenses (Xu, 2013).

The Importance of Transformative Learning

If China is to truly adopt and implement Western pedagogical models, it must first be willing to critically examine and challenge the values and application of the Confucian model it has been utilizing for thousands of years: this can only be achieved through transformative learning. According to Marx et al. (2004), transformative learning is

defined as learning through which individuals critically challenge their beliefs, knowledge, and environment to understand a range of events and phenomena from perspectives outside of their own experience. This new information will then influence their subsequent decisions and reshape or transform their worldview and behaviours. Cross-cultural exchange programs, such as the RLP, have the potential to initiate this kind of transformation by compelling science pre-service teachers to expand the boundaries of self-awareness and apply critical thinking and analysis to both their own studies and to their conceptions of teaching. The pre-service teacher candidates not only come to Canada for an education; they come to critically reflect on China's education model by critically comparing their experiences in China with those that they experience and witness in Canada (Laros, Fuhr, & Taylor, 2017). The process of change has the potential to transform the identity, worldview, and behaviours of the science teacher candidates. Looking to the future, there is a need for a transformative learning to understand the critical moments that facilitated transformation among exchange students.

According to Taylor (2017), transformative learning is a process of development that stems from experience. Mature cognitive development is the basis for the critical reflection and rational discourse necessary to participate in transformative learning. For pre-service teachers, these findings demonstrate the importance of engaging participants in classroom practices that help to develop critical reflection through the use of reflective journal and critical discourses. In addition, it also means recognizing that becoming more transformative is a process that takes time and practice. In order to change the pedagogical approaches currently employed in China, it is critical to first challenge and

transform the perspectives of those who create and implement China's current curriculum: this can only be achieved through transformative learning.

According to Grin, Rotmans, and Schot (2010), the theory of transformative learning argues that the process of "transition perspective" is comprised of three elements: psychology, which refers to understanding changes in self; belief, which refers to shifts of perception; and behaviour, which refers to changes in lifestyle. This theory is reflected in the current study as the participants were asked to write reflection notes and answer interview questions that facilitate psychological, perceptual, and behavioural changes. As their conceptions of their environment may have changed during this process, their teaching style may have also changed. Transformative learning extends consciousness by transforming the basic worldview and the specific abilities of the self through a conscious guiding process (Schlitz, Vieten, & Miller, 2010). After the participants completed their sojourn in Canada, their worldview may have been changed, and they may have gained the ability to understand different cultures and promote their own transformative learning.

Mezirow (2000) believes that the transformation of perspectives that lead to transformative learning rarely occurs because the learners are usually inspired by a dramatic shift or life event, though it may occur as a result of accumulated changes over a period. This will be applicable to the current study's participants because they will encounter dramatic difficulties and challenges when they come to Canada, and the journey will likely be a major life event. While in Canada, they will experience language, culture, and even life difficulties, which have the potential to lead them to the stage of transformative learning.

According to Taylor (2007), a critical component of transformative learning is that it challenges individuals to change their frame of reference by critically rethinking their assumptions and beliefs. As a result, they consciously develop and implement plans that lead to new ways of defining and engaging with their world. This process is fundamentally critical and analytical. The current study's participants wrote reflection journals and answered interview questions that encouraged them to critically reflect on their pedagogical understanding of their future science teaching model and consciously formulate and implement plans to change China's future science education.

Elements of transformative learning. According to Mezirow (2008), the two main elements of transformative learning are critical reflection and dialectical discourse. Critical reflection requires the participants to recognize their preconceived notions and openly and critically examine and challenge these preconceptions (Mezirow, 2008). Likewise, rather than outright rejecting opposing views, they must critically examine and consider opposing positions. This critical reflection can take several forms, but personal journals are a primary element of this. It is important to keep in mind that these journals must engage in critical evaluations and not simply catalogue an itinerary of events. The dialectical discourse works in a similar way and can include one-on-one interviews or discussion with colleagues and peers, as well as group discussion, which may take the form of focus groups or a collective of peers and colleagues simply having a discussion (Mezirow, 2008). In this context, it is critical to listen to opposing views and not simply challenge them or argue against them.

Transformative learning does not simply require one to consider opposing views: learners must be willing to critically examine and challenge their own preconceptions

(Mezirow, 2008). For students who are from a teaching-centered context, this might mean re-examining the excessive use of auditory learning approaches, which requires a critical reflection on the context and goals of their own and opposing education systems. Based on engaging in these kinds of critical self-reflection, the transformative learner should see a change in their behaviour.

Reflective journals. Reflective journals are a way to facilitate transformative learning. Before participants write these reflective journals, they need to understand the difference between descriptive writing and critical writing.

Descriptive writing. Descriptive writing focuses on reporting data rather than developing an argument or providing analysis. Instead, one merely establishes the background information on a given topic, from which an argument can be developed. It outlines verifiable facts without presenting any analysis or discussion. According to McCarthy (2008), descriptive writing focuses on developing an understanding of a given topic through the precise use of descriptive and sensory language. In an academic context, particularly in a literature review, descriptive writing might include what kind of methodology was used in a study, when it was published, who wrote it, how many participants were involved, and what the key findings were. This provides the context upon which the study's analysis will be done. Thus, as McCarthy (2008) suggests, descriptive writing is expository in nature and is used to describe and present facts to the reader. This ensures that the reader will be able to understand the context of the author's arguments. Chinese students, who learned in a Confucian and teacher-centered context, may rely too heavily on this as they have often been expected to simply restate

information, they have learned rather than adding analysis or critical interpretation to what they learn.

Critical writing. According to Goatly and Hiradhar (2016), critical writing in an educational context is more fluid in its definition and can serve different purposes in different disciplines and within different studies. They suggest that to some, critical thinking simply means identifying logical flaws in a study's analysis or arguments or considering contradictory evidence from contrasting claims. They go on to state that being critical requires one to question the assumptions forwarded by 'rational' arguments and questioning how a given 'logic' establishes a conclusion. This allows academics to identify how an understanding of a given phenomenon can be constructed, and how specific criteria are used in a given discourse to justify claims or conclusions.

Critical discussion. Though reflective journals are helpful, they do not allow students to remove themselves entirely from their own perspective; however, critical discussion can expose students to perspectives outside of their own. Mezirow (1998) states that in order for learning to be transformative, the learning must take place in an unfamiliar environment. Study abroad programs certainly conform to this; however, when writing critical journal reflections, the learner remains in a familiar environment: their own cognitive perspective. Placing them in a critical discourse with other academic minds, each of which has a different perspective, places them in a cognitively unfamiliar environment that can, as Mezirow (1998) states, impose the kind of intellectual confusion that facilitates transformative learning. This confusing dilemma has the potential to create a perspective-challenging discussion. Discussion with peers and educators encourages

learners to critically examine their perspective, and teachers specifically can offer theoretical contexts and supplemental information that can support their learning.

In the context of the current study, after the Chinese pre-service teachers came to Canada, they were required to engage in critical discussion with teachers, students, and school faculty. In short, they must take advantage of the insights offered by all of those whom they come into contact with while in Canada. During this process, they must be active listeners and willing to consider perspectives that conflict with their own. They must also engage in one-on-one and group discussion.

Behavioural changes. As Crowder (2014) notes, when participants contribute in an intercultural exchange program, learning reflections can be accomplished through critical engagement. Crowder (2014) examines how students change their behavior and develop new skills and knowledge, and how these changes occur in Mezirow's four phases:

1. acquiring skills and knowledge,
2. trying new roles,
3. integrating new skills and knowledge into one's life with a new perspective from experience, and
4. increasing confidence and ability in new roles (Mezirow, as cited in Crowder, 2014, p. 11).

A number of studies have identified the importance of facilitating transformative learning, and according to Fordham (2006), international exchange programs see their students as agents of cultural change who promote global citizenship by fostering a commitment to cultural diversity and an interest in cross-cultural communication.

Therefore, international exchange programs should aim to achieve cultural change and raise awareness and promote the adoption of alternative, multi-faceted approaches to transformative learning (Laros et al., 2017). Transformative learning facilitates self-development and awareness, which leads to enhanced self-confidence and self-esteem, and this is often the most noticeable change in returned exchange students (Crabtree, 2008). However, it is not entirely clear how this can be accomplished. For example, students who are unaware of transformative learning before beginning an exchange program may not understand how to enable the transformative aspects of such programs. For those who do know, it is critical to determine whether they are given the tools and guidance required to promote transformative learning, particularly in the context of science teaching. Moreover, few studies have utilized narrative inquiry to develop an understanding of these issues and have instead relied on quantitative and cross-sectional survey or qualitative studies. In contrast to quantitative and cross-sectional surveys or qualitative studies, narrative inquiry allows study participants to define what is central and crucial in their experience by using their own terms (Connelly & Clandinin, 1990). Narrative inquiry can likewise help researchers gain a deeper understanding of the participants' attitudes, viewpoints, and behavior patterns (Kothari, 2004). Using narrative inquiry to explore how pre-service science teachers engage during such exchanges and understand the barriers to ensuring that their learning is transformative can help to gather insights into this issue and develop recommendations to make future exchanges more transformative. Thus, the current study explores the breakthroughs brought by the transformational learning in the national exchange project by focusing on cultural exchange, language exchange, and character cultivation. This focus aims to determine

how the students participating in the project reflect on themselves, their perspectives, and their experiences, as well as how they plan to apply what they have learned in future context. This will allow the RLP and similar programs develop and implement strategies that maximize the transformative nature of exchange programs so as to benefit pre-service teachers and the communities in which they will teach.

CHAPTER 3 METHODOLOGY

Research Design

This study will employ narrative inquiry to investigate Chinese Pre-Service Science Teachers' Cross-Cultural Experiences in Canada. Narrative inquiry allows study participants to define what is central and crucial in their experience by using their own terms (Connelly & Clandinin, 1990). According to Kothari (2004), it can help researchers gain a deeper understanding of the participants' attitudes, viewpoints, and behavior patterns. This research will employ observation, field notes, analysis of students' reflective journals, and participant interviews to open dialogues with pre-service Chinese science teachers in Windsor.

According to the *Oxford handbook of qualitative research* (Leavy, 2014), narrative inquiry or narrative analysis emerged as a discipline in the broad field of qualitative research in the early 20th century. Narrative surveys use live texts—such as stories, autobiographies, journals, field notes, letters, conversations, interviews, family stories, photographs, and life experiences—as units of analysis to gain insight into people's meaning in life. Narrative research has been used as an analytical tool in the fields of cognitive science, organizational research, knowledge theory, sociology, occupational science, and educational research. Other methods include the development of quantitative methods and tools for mass capture based on fragmented artifacts, as well as methods and tools for self-representation or indexing at capture points.

In the current study, although participants were from the same pre-service teacher education program, they all had different educational and family backgrounds. It has been observed that previous experience influences every learning situation (Gravoso, Pasa, &

Mori, 2002). When they joined the project, all the participants had different understandings of the programs, and ambitions. They also had unique experiences when they were in Canada.

Narrative inquiry is a study of how humans create experiences by telling stories, which can reshape the past and create future goals. The current study employed narrative research as a way to observe and interview participants. The stories of the participants reflect their cross-cultural experience and have great significance for subsequent research. Narrative inquiry is an appropriate methodology to obtain the answers of my research questions, which seek to determine what cross-cultural experiences and challenges Chinese exchange students encounter in this program and how participation in this program influences their perceptions of science teaching. The purpose of my research is to determine how this program can broaden the horizons of science teacher candidates and encourage them to become innovative and culturally intelligent teachers in the context of global education. Through narrative inquiry, participants can share their stories instead of just respond to the pre-define questions typical of survey. This will provide more comprehensive information than other research methods.

Participants

The current study's participants—pseudonymously named Pauline, Jennie, Holly, and Zelda—were four pre-service science teachers in reciprocal learning program from Southwest University in China who spent three months at the University of Windsor to observe teachers in a Canadian public-school environment, take classes, attend workshops, and participate in lectures. Four participants were in their third year of university study, and they were all approximately 20 years old.

As a research assistant, I worked with the 2018 full cohorts of Chinese teacher candidates, from whom I recruited my thesis research participants. Throughout my one-year participation in the program, I accompanied and followed up with Chinese science preservice teacher candidates at the University of Windsor. I believe that all the preparation work and the enriched trip itself have allowed the Chinese teacher candidates to develop a bond with me, thus encouraging them to share their stories with me.

Data Collection

Data collection for this study involved three components: participation observation, reflective journals, and interviews.

Participation observation. Participant observation is defined as one type of data collection method, which is often used in qualitative studies. Berg (2007) states that participant observation aims to gain a close and intimate familiarity with a group of individuals through an intensive involvement with people. As a research assistant (RA) for the Reciprocal Learning Program, I accompanied science teacher candidates, including my study participants, in Windsor. Therefore, one of my research methods was participant observation. As the researcher, I observed them while they were engaged in activities and school visits in Windsor. My participant observation included how participants reacted and responded during their stay in Canada, their visits and teaching demonstrations in the elementary and secondary schools in Windsor, and their participation in reciprocal learning cultural activities prepared by the University of Windsor. As a result of my involvement in the program, I developed close working relationships with these participants in particular and therefore had the opportunity to observe them on a regular basis throughout the program. This allowed me to view the

participants' experience from my own perspective and to see how they reacted or behaved in school settings. My critical observations might be different from the participants and I might have noticed important elements of their learning process that they did not.

At the same time, I took field notes of our class time, planning meetings, and some informal communications during the trip. I began taking my field notes using a report style, noting the time, location, participants' facial expressions, gestures, and topics discussed. According to Xu (2013), the notes should not just be from the recorder's transcription; instead, they should be like a video showing the visual details as well. This real-time data collection allowed all relevant details to be considered, and I did not need to rely on recall. With constant review of my notes, my reports gradually transitioned into field notes, which became valuable and helped me think narratively. In this study, field notes were analyzed to construct narratives from the participants. This best illustrated how people make meaning of experience by telling and retelling stories about themselves that refigure the past and create purpose in the future (Connelly & Clandinin, 1988). As this study is part of the Reciprocal Learning Program, I was able to build my thesis on my own work for the program. Therefore, I took advantage of the field notes written during the program to develop a narrative way of thinking about experiences and stories in this thesis.

Reflective journals. In order to collect information about the participants' daily experiences, they were asked to keep reflective journals, which were read and analyzed weekly (Berg & Lune, 2004). These journals were submitted by the Chinese participants throughout their three-month stay in Canada and consisted of observations that they made

and reflections on their experiences. This process allowed them to explore what they think of and how they think about their cross-cultural experiences, science teaching, how teachers engage students, and how students perform in class. The journals also allowed the participants to reflect on and summarize their own learning with a special focus on language development, cultural understanding, class observation, and science teaching practices. This gave the researcher insights into their internal thought processes, which cannot be recorded through simple observation. In addition, it gave participants the freedom to offer thoughts on any experiences or challenges outside of those explored in the interview process, thereby enhancing data collection. The requirement of reflective journal outlined in Appendix A was used to guide the participants.

One-on-one interviews. One-on-one in-depth interviews were employed as another research method to collect data in my research. Built on the interview guidance for the program, I prepared three sets of interview questions (Appendix B) and conducted three interviews: one when the participants first arrived in Canada, another in the middle of the project, and a final interview prior to leaving Canada. I booked private rooms in the University of Windsor library in advance to ensure the confidentiality during the interview. Based on participants' individual situations and their interactions with me, some of these questions were revised. The purpose of individual interviews was to understand the participants' narratives, thoughts, and reflections on their trip (Berg & Lune, 2004) to Canada, as well as reflections on their cross-cultural learning experience in Canada and how it influenced their personal and professional cross-cultural development. Interviews were guided by a set of open-ended questions. Compared with using a questionnaire, open-ended questions allowed participants to answer more fully as

they were not forced to choose an answer. This also encouraged them to share a greater range of ideas and allow for unexpected responses. The interviews lasted approximately 30-40 minutes each and were conducted in Mandarin because, as science teacher candidates, some of the participants were not proficient English speakers and were therefore more comfortable sharing their narratives in Mandarin. To obtain valuable insights into their experience, it was imperative that they were able to express their ideas fully and clearly so as to avoid any misunderstandings.

During the interview, I asked them to share their narratives with me and what they found most significant about their sojourn. All the responses from my participants will be respected and valued. After the interviews, the transcripts were sent back to the participants for revision. As my research is situated in the Reciprocal Learning Program, this allowed me to approach my participants by building on the well-developed relationship through their participation in this program. Under its umbrella, I did not have to worry about approaching the participants for my study as they will expect this. During my research phase, I was able to observe their most natural reflections. When I interviewed the Chinese teacher candidates, they were able to more comfortably express and explain themselves because we have the same cultural background and we are education students. I was able to gather data about their real living and visiting experiences in Canada, which will provide readers with an overview of cross-cultural living in Canada and allow them to better understand the benefits and challenges experienced by participants in the Reciprocal Learning Program. After the interview finished, I shared my schooling and knowledge with them, and they were able to tell me

about current science educational issues in China, which allowed us to “reciprocally learn” from each other.

Data Analysis

The data collection relied exclusively on text-based data in the form of observation notes, transcripts of interviews, and reflective journals. Therefore, the analysis method was likewise text-based. Data analysis involved multiple readings of the observation field notes and reflective journals, as well as listening to the interview records repeatedly and constructing tentative narrative accounts of each participant’s experiences. The researcher sent these accounts back to the participants via email so that they could verify the accuracy of the account and make any necessary changes. These were then compared to note the emerging and recurring themes or narrative threads (Clandinin & Connelly, 2000), either in individuals’ stories or across participants’ stories that related to the two research questions about Chinese Pre-Service Science Teachers’ Cross-Cultural Experiences in Canada.

Observation notes. In order to organize data for analysis, I constructed a chronicle/summary account of what is contained within different sets of field texts. I also recorded the dates, topics involved, and contexts for each of these field notes. I then printed these texts for further analysis. While reading and rereading these texts carefully, I used colour-coded highlighters and adhesive strips whenever I identified any meaningful incidents or interesting thoughts from the participants.

Interviews. In accordance with the inductive analysis strategy proposed by Lodico, Spaulding, and Voegtle (2010), the interview data collected from the four interviews was analyzed. That is to say, after the recording of the interview and the

transcription of the notes, I reviewed and explored the data by reading a few times to develop a general understanding of the scope of the data. After the initial review, the interview data was coded and categorized, and I identified several patterns and themes. Since the process of qualitative data collection and analysis is iterative and recursive, I repeated the above steps until I extracted significant meaning from the data. This inductive data analysis was also performed throughout the data collection period.

Reflective journals. According to Ortlipp (2008), reflective journals allow participants to more precisely express their “experiences, opinions, thoughts, and feelings” (p. 695). Thus, the researcher collected reflective journals every week and used a highlighter to underscore sentences and phrases related to the research while carefully reading and re-reading the journals. In this part, the researcher focused on the content that was different from the class observation field notes. Based on the data collected from the journals, the researcher adjusted the interviews questions.

Connecting the data. All forms of data collection have limitations; thus, to obtain accurate results, it is critical to connect different kinds of data to determine which trends are consistent or universal throughout the data. To achieve this, the researcher sorted through sets of transcribed interviews, participants’ journal reflections, and field notes from observation. These were then categorized by participant and placed in chronological order. The researcher coded the content of the interviews, and reflective journals, an observation notes based on two categories: cross-cultural experiences and challenges, and implications of participants’ science education. For example, I found they often mention “homesickness”, so I decide use that phrases as a category. All three sets

of data were merged together and triangulate to develop a more comprehensive and impartial understanding of the participants' experiences.

CHAPTER 4

FINDINGS

Based on the data, several trends were identified with respect to their transitional experiences in Canada, which are framed within the context of their high school and university experiences in mainland China, particularly as they relate to science teaching. Likewise, a pattern of challenges was identified with regard to their transitions, and coping methods were identified.

High School Experience in China

When I asked the participants to reflect on their academic lives in mainland China, each of the participants claimed that their schedules were booked to capacity with academic responsibilities, such as test preparation and course readings. Three major themes emerged from the data related to this period: educational and professional opportunities, traditional learning approaches, and competition for higher education.

Educational and professional opportunities. Throughout Chinese history, education has always been the means for social mobility. From the fifth century BCE, through to the 19th century, students (always men) devoted their lives to study until they were well over 20 years old and often in their 30s in order to pass all the civil service exams necessary to be appointed as one of the educated and ruling elites in China. Nowadays, in order to secure a better future, students in China from a young age are repeatedly told to study so that they can go to the best kindergarten, the best elementary school, the best middle school, the best high school, and the best university. Pauline recounted her high school experience, which was typical for a student in China:

I had a very tough time in high school. I had to study Monday through Friday from 6:00 a.m. to 12 midnight, during which time I stayed in school with my classmates

from 7:00 a.m. to 9:30 p.m. We even had to go to school on Saturday and Sunday mornings! Despite this excessive amount of work, Pauline noted that the school's rate of enrollment is excessively high, in part because it employed the Hengshui model, which according to Pauline involved students doing college entrance exam exercises every day. Though she conceded this model had positive short-term effects, she questioned whether the approach had long-term benefits.

Traditional learning approaches. In order to get high marks on exams, a more traditional approach to learning has been adopted in the Chinese education system. This transmission model (spoken of in China as *tian ya shi jiao xue*: spoon-feeding teaching) requires that students be passive learners. They are required to memorize tremendous amounts of material from their textbooks and teacher's lectures and then be able to restate them in response to exam questions. Though this does not necessitate extensive critical thinking, it does require students in China remain busy with schoolwork.

Holly found that the expectations held for her as a high school student in China were not consistent with those that teachers in Canada had for their students. Holly recounted her high school learning experience: "In China, the teacher just gives students a formula, and as students, we focus on lesson content, do our homework, practice for hours, and memorize the formula. Then we can secure high marks." Holly was a pre-service chemistry teacher and could still recall that when she was in high school chemistry class, the periodic table of elements had to be memorized. She stated that "When students took an exam, they needed to pick up the periodic table of elements in their mind." However, when she walked into the chemistry class in Canada, she found that every teacher had a copy of the periodic table on their classroom wall and gave each

student a small copy as a reference tool to use during exams. This allowed students to focus on critical thinking rather than rote memory and recall. Thus, it was clear that in Canadian schools, even in a science context where there are objective facts that students must know, critical thinking is the focus.

China also employs a teacher-centered approach that expects all students to conform to the expectations of teachers, though they do offer students in grade nine an opportunity to focus on STEM subjects or the humanities. In Canada, however, students are given choices as to the level of study they want to pursue, as well as a choice between which subjects they want to study. For example, in grade nine, Holly chose to study STEM subjects, but once she chose this stream, she had no further choices. In Canada, though, Holly notes that a student may choose a STEM subject and then choose the level at which they wish to study: university track for those who wish to go to university, or vocational level for those who wish to go to college. In addition, students can choose which specific subjects they wish to take: one student could choose chemistry, biology, and statistics, while another might choose math, physics, and statistics. Thus, Canada uses a more student-centered approach with respect to academic expectation and course schedules.

Holly observed that the options offered to high school students in Canada had benefits that were not present in China's model. In China, every student is expected to learn at a level consistent with university standards. As a result, the exam assessments and course work are challenging, and all students are required to make a significant commitment to school and perform an extensive amount of homework to do. As a result, Chinese students must spend significant time solving problems and answering questions

to earn marks that are high enough to secure entry into university even if university is not a personal goal. This may result in wasted time and frustrate students whose learning goals are not consistent with the curriculum outlined by China's Ministry of Education. Holly notes that allowing students to choose between university-track courses and vocational-track courses will ensure all students have enough time to plan for and accordingly invest time in their future.

This experience was echoed by Pauline, who found similar differences in between China and Canada's elementary schools. When learning in China, Pauline noted that she had limited opportunities to explore the world on her own terms:

I had no time to do what I wanted, to take a walk, to go to the ocean, to write journals, to talk with my parents or have some communication ... I had no time. I spent so much time in school.... but there were things that I really wanted to do. I had no time for that.

However, she observed that while China's education does not give students the power to choose, the Canadian system instills choice as a learning component in the early stages of education. For example, when she was attending a Canadian elementary school, a first-grade teacher assigned a colouring project as homework. However, rather than prescribing that every student colour the same image, she asked the students to choose a picture to colour. The selection process was slow; so, Pauline recommended that teacher randomly pick one and give to the students. However, the teacher still insisted that the child should choose their own, and Pauline stated that that she was touched by and impressed with the fact that students were so empowered. She felt that this approach cultivates children's awareness of their own choices.

The participants also noticed a stark difference in the amount of time students spent studying and how that time was divided. For example, Canadian classes require students to be active participants in the learning process. In class, students were asked to do research, group work, class discussions, and oral presentations, a totally different way of being a student from what they were accustomed to in mainland China. They were also surprised to find that school days in Canada are shorter: China's school day lasts from 8:30 am to 5:30 pm or longer with the potential of additional homework added to that; the Canadian school day only lasts from 9:00 am to 3:30 pm. In addition, the participants collectively suggested that the homework the Canadian students did receive was less challenging than the homework students in China typically received, particularly with respect to math and science. Another key difference between the Canadian and Chinese classrooms the noted was the length of the classes: in China each class is 45 minutes and followed by a 10-minute break; in Canada, classes are 90 minutes and are followed by a 20-minute break. They felt that this class length was excessively long as students, particularly those in primary grades, simply cannot focus for that long.

Competition for higher education. China's education system is highly competitive, and Pauline, Zelda, and Jennie were each familiar with pressure that this competitive education environment can lead to as each of their parents expected them to finish at least one university degree so that they could have a better future. In order to go to a university in mainland China, each student has to write the annual National College Entrance Exam in July. Those who want to go to the best universities must get the highest possible marks. In contrast, Canada's education system is relatively relaxed. When the participants completed their six-week high school internship, they came away with the

impression that the Canadian education system did not put excessive pressure on the students because most of the teachers in Canada respected the students' autonomy. This approach works under the assumption that allowing students to make their own academic choices will ensure they have a future is more consistent with their own life goals. Students who want to enter a quality university must still be diligent with respect to their scholastic work and secure high grades, but such expectations are not projected onto all students.

Zelda shared some of her experiences in Canadian high schools and how high school education in Canada allows everyone to participate or pursue something that interests them:

Students can choose the course they want based on their interests. Interest is the best teacher. Students do not have to concentrate their attention and time on school subjects. Students have free time to develop their personal interests, such as painting, dancing and other non-academic activities.

Zelda's observations show that Canadian students have autonomy in academic pursuits and personal interests. In this model, personal development time is relatively abundant but contrasted her own experience in China:

In order to go to top universities, we needed high marks on Gao Kao [the name of China's university entrance exam]. We were under great pressures from our parents, our teachers, and even ourselves to excel in our academic studies. We had to always focus our attention and time on the school subjects. We did not have any free time to develop our personal interests, such as drawing, dancing, and other non-academic activities.

Zelda's experience demonstrates the lack of autonomy China's students have with respect to their academic pursuits and their engagement with personal interests or pursuits. In this model, there is limited time for personal development, but the contrasting model she saw in Canada encouraged her to consider the benefits of alternative approaches.

Education for All vs. Education for You

The participants' experiences also underscored the difference between access to education in China and Canada. In China, children from wealthy families are more likely to succeed; in Canada, children have more equitable access to education. This observation is highlighted when comparing the experiences reported by Jenny and Pauline. Jenny's internship high school was rated second highest in Windsor. Through communication with teachers and students, she learned that the economic situation of the school's students was relatively secure. Moreover, many students in this school have chosen to be art majors, which typically requires considerable financial support in China. However, the school where Pauline went featured many refugees, and the economic conditions of the schools' students was not as secure as those from the school where Jennie was placed. In China, such students would likely not have access to an extensive art program, but in Canada, the government will provide the necessary resources if those students are also interested in pursuing a degree in arts. Thus, all parents can support their children's interests regardless of their economic situation. This means that students in Canada have access to more equitable education opportunities.

Despite seeing the difference in context, Zelda and Holly felt that China's system was more equitable than Canada's. They believe that Gao Kao, China's college entrance examination, is an educational equalizer because any student who secures a high score on

it will have access to free, quality education. Thus, as Zelda notes, China's education system promotes the notion that knowledge changes fate and allows students from both urban and rural China to pursue their academic pursuits. In contrast, Zelda suggests that "Canada's education system gives children the power to choose independently but does not stress the importance of knowledge." Moreover, students are allowed to direct their own level of engagement. Holly and Zelda both observed that many students would spend time on their smartphones rather than listening in class, and teachers did not compel students to listen or provide students with the guidance required to reinforce the importance of knowledge. Thus, they both conclude that China's education system is superior because it compels students to engage and recognize the power of knowledge despite being less democratic.

Pauline shared an observation with us. Geography is actually a sub-discipline in China. However, when she observed the school in Canada, she found that each subject was equal, and no one treated Geography class like it was not really important. All participants were impressed by the fact that elementary school teachers taught almost all subjects in the school. They told me they were touched by teachers' words that "we are teaching geography, math or English, but most importantly, we are teachers! We have to know how to educate people and how to teach. Students are flames and teachers should kindle the flames".

Experience and Challenges in Exchange from China to Canada

When asked about their experience from China to Canada, three challenges emerged among the participants responses: their initial homesickness, limited English

language proficiency, time management, change of concept and isolation during integration.

Initial homesickness. Though each of the participants had lived on their own in China, each of them had always been in close proximity to their parents; this exchange was the first time they had lived on their own without having access to immediate and personal support from their parents. As a result, each of them had suffered from homesickness during the first two weeks except for Jennie, who expressed that she was eager to get away from her ‘controlling’ mother. For example, Pauline noted that she lived with her mother for 20 years and had never been so far away from her. As a result, she called her mother numerous times throughout the first two weeks. Zelda began to feel excessively homesick by the second or third week and even “cried on the phone while talking to her mother.” Holly reported that she missed her parents when she “was unhappy or had difficulty”. She went onto state that her parents “always did everything for” her and believed she could not handle living on her own. Holly was also concerned about worrying her parents, so when she fell during a physical education class, she did not tell her parents because she was “afraid they would be worried.” This was consistent with each of the participants, except Jennie, who soon realized that they could no longer tell their parents about things that bothered them because, with the Pacific Ocean in between them, their parents could do nothing but worry more about them if they told them all their troubles. They learned to keep all problems to themselves and only share positive information with their parents. Zelda, Holly, and Pauline realized that they needed to be strong in order to support their parents during this difficult time in their lives

rather than seeking comfort, understanding, advice, or guidance from their parents, as they used to do in mainland China.

Language. Because Holly, Jennie, Zelda, and Pauline were doing their undergraduate study in mainland China before they came to Canada, they participated in Canadian high-school classes but did not have to worry about the content, assignments, or grades. Therefore, their main goal was to improve their English as quickly as possible to understand the Canadian teachers. When Holly, Jennie, Zelda, and Pauline started their class observation in high school, they struggled and were frustrated with their limited English proficiency and did not have confidence speaking with the Canadian teachers and students. I observed that when they had lunch in high school, all the teachers gathered in the staff room, but the participants only socialized with other pre-service teachers from the RLP, with whom they spoke Mandarin. They rarely spoke with the Canadian teachers.

Time management. Because the school days in Canada are significantly shorter than those in China, the participants had more time for themselves and were not sure how to effectively utilize it. Holly's feeling of unhappiness was typical: "I didn't have lots of things to do and I felt empty. I am that type of person who, if I don't have enough things to do, will focus on some unrelated activities." At first, Zelda observed that she and some of her peers were unsure how to use their time, which limited their overall engagement and learning outcomes: "I do not think I learned a lot at the high school where I was placed because I was not really involved. Based on my observation, my peers struggled with this as well as they often seated themselves in the corner and took notes. I didn't

work hard enough.” This highlights the need for the participants to maximize the time they had allocated to them.

By the end of their first week, though, the participants had realized that they needed to change their previously study methods in order to manage their time more effectively. During the term, each of them found that although they worked diligently and spent most of their waking hours on their internship, they never felt integrated into the Canadian learning environment. They always rushed to finish their daily reflective notes, debriefing, and newsletters. However, on some occasions, they had to stay up until 1:00 or 2:00am to finish their assignments. When asked to participate in activities, they felt overwhelmed. In fact, one interview had to be rescheduled because they were "too exhausted to stay awake and talk" after they handed in their assignments.

Holly: “I have problems with time-management. I planned to preview my lessons which I need to learn in China in the same time, but I didn't do it. If I had managed my time reasonably, I would have enough time to preview before I go back to China.”

Clearly Jennie, Holly, Zelda and Pauline transferred their old learning strategy: that is, cramming and memorizing information they listened to. Toward the end of their first week, they realized that they should aim to understand what the teacher taught, rather than just take notes. However, learning to change study methods and to manage their time better in effect forced them to discipline themselves and set up their own study schedule, as no one in Canada would "push" them to study.

Holly: “We have to change study habits. From China to Canada, it's a big jump. I heard many Canadian students also fail in their first year because they do not change their study habits when they come to university. In high school teachers may push you a little

bit, but only you can help yourself! In Canada, it's up to you to decide when, where and how to study by yourself.” Toward the end of their exchange program, all four participants agreed that they had become more independent and mature learners in Canada than they were in China.

Isolation. At the University of Windsor, the Chinese exchange students also took some courses with the domestic students. In this context, the feeling of isolation as a separate group was strong throughout the three-month exchange. The school had no mechanisms in place to ease their integration into the school population or to address some of the difficulties they encountered when adjusting to a different academic setting in a different country. For example, when attending physical education classes at the university, the exchange students wanted to participate in the sports activities; however, the teacher did not allow them to participate. There could have been several reasons for this exclusion. For instance, the school might have been concerned about liability issues should there be an injury, or the teacher might have been concerned about the exchange students’ skill level and how it would impact the class or the amount of class time that would be required to explain the rules of a given activity to the exchange student. However, the participants reported that the only reason the instructor offered was that there was not enough sports equipment, which was not actually true. As a result, the exchange students reported feeling alienated and excluded. Whatever the issues impeding their involvement might be—its liability, class dynamics and/or time, or available equipment—the schools should ideally address them so that exchange student can be included so as to reduce their sense of isolation and facilitate their integration.

School Differences between China and Canada

Through interviews, participants offered their views about the differences of teaching approaches between China and Canada (Table.).

Primary school.

	China	Canada
Teacher Specialization	<ul style="list-style-type: none"> • Discipline-specific teachers 	<ul style="list-style-type: none"> • General studies teachers
Time Setting	<ul style="list-style-type: none"> • In class time: one Period 90 mins • Break time: 20 mins 	<ul style="list-style-type: none"> • In class time: 45 mins • Break time: 10 mins
Learning Emphasis	<ul style="list-style-type: none"> • Memorization and recall • Intensive 	<ul style="list-style-type: none"> • Process and engagement • Broader
The number of students	<ul style="list-style-type: none"> • 50-60/class 	<ul style="list-style-type: none"> • 15-20/class

High School.

	China	Canada
Curriculum	<ul style="list-style-type: none"> • Inflexible curriculum 	<ul style="list-style-type: none"> • Mandatory + optional courses (academic or applied streams)
Classroom setting	<ul style="list-style-type: none"> • Fixed location 	<ul style="list-style-type: none"> • Students rotate for different subjects

Differences in science education.

	China	Canada
Course Content	<ul style="list-style-type: none"> • Rigid • Does not promote students' creative and critical thinking • Focus on students' grades 	<ul style="list-style-type: none"> • Organic • Promote students' creative and critical thinking • Emphasize student's practical understanding and development
Text books	<ul style="list-style-type: none"> • Concepts, formulas, and examples 	<ul style="list-style-type: none"> • Visual tools • Problem- and logic-oriented questions.
Teaching Method	<ul style="list-style-type: none"> • Teacher-centred learning • Limited student engagement • Lecture heavy and focus on textbook 	<ul style="list-style-type: none"> • Student-centred learning • Promotes student engagement • Group activities

In participant perspective, the differences between China and Canada education can be categorized in the following list:

1. Canadian students are less stressed than Chinese students. In China, most high school students study more than 10 hours a day, and some students study longer, usually from 6 am to 9:30pm.

2. In Canada, teachers use a variety of teaching methods in the classroom, such as role playing and group work. In China, they rarely use these methods of teaching. Most of the time, teachers give lectures, and students take notes.
3. Teachers provide students with many handouts in Canadian courses. Everything is on the handout. Chinese teachers rely more on textbooks and some workbooks.
4. There are also some differences in the homework. The homework in Canada is more practical and interesting. Students must use their imaginations to express their opinions. Students need to consider many subjective factors when completing their homework. Chinese homework is exam-oriented and tends to be objectively based only on facts and is designed to focus on students' memory and analytical skills.
5. In Canada, students can pursue their own interests. However, in China, parents play an important role in determining what students' interests should be.
6. In contrast, in general, Chinese students tend to excel in academic work because students often take additional academic courses after school, usually in math, English and writing. In Canada, students can pursue their non-academic interests after school.
7. In China, the classroom is for students. Teachers go to different classrooms to teach. In Canada, the classroom is prepared for the teacher. Students go to different classrooms to study.
8. In Canada, the teacher's classroom is designed in a variety of styles based on the personality and subject of the teacher. In Chinese classrooms, there are portraits of celebrities who make great contributions to human development on the walls of the classrooms.

9. There is only one teacher in each Chinese classroom, but in Canada, there may be teachers, teaching assistants or co-teachers.

10. With the exception of some schools in major cities, Chinese students are generally only Chinese. In Canadian classrooms, there are often students from different ethnicities and cultures. In Canada, teachers need to have the skills to teach different cultures.

Changing Perspective about Science Education

Through the above comparison, as science pre-service teachers, science education was always on the participants' minds. Through the international exchange program, they learned how to possibly change perspectives about science education by stimulating students' curiosity, using knowledge application, changing science teaching pedagogy and student assessment. Each participant reported different experiences related to their class observations as they apply to improving science teaching.

Stimulate students' curiosity. The study's four participants reported different experiences related to their class observations as they apply to stimulating student's curiosity.

Pauline and geography. Pauline majored in geography and loves the subject thanks to her high school teacher who "made geography interesting." In one of Pauline's reflections from the first week, she observed that the pre-service program in Canada emphasized teacher candidates' motivation to teach and described her experience in geography class. With the purpose of learning "the different approaches to teaching," Pauline paid particular attention to teaching strategies. In the second week of auditing the pre-service program, she wrote on some of the differences between Chinese and Canadian pedagogies. For instance, in China, professors often put an emphasis on

academic grades rather than students' curiosity, whereas Canadian professors emphasize stimulating students' curiosity. For example, the only requirement for lesson planning in the geography class was “stimulating students' curiosity.”

When observing teacher candidates' presentations of their lesson plans in the geography class, she posed two questions:

1. “How do Canadian teacher candidates stimulate students' curiosity?”
2. “What is the knowledge and skills they focus on?”

Canadian teachers combined numerous materials when they teach. For example, the teacher will let the students draw their own population maps. Students will get a lot of materials: forms, pictures and crayons. The students found it engaging, and the works made by each group were varied and unique. In addition, sometimes, students will be shown video information during class, which often arouses students' interest. Pauline also remembers that the teacher taught the students to add, subtract, multiply, and divide within ten. Before that, the teacher played math songs for the students to make the class interesting. The teacher also brought apples and instructed the students to count by distributing the apples to stimulate the students' interest, which an essential element of teaching for Canadian teachers. In the classroom, Canadian teachers do not lecture students' as much as Chinese teachers; instead, they constantly motivate students to ask and answer questions. Pauline was impressed by Canadian teachers' creative and innovative presentations, and she reflected on what she perceived to be advanced teaching strategies.

Based on these observations Pauline developed a teaching identity: “As a Geography teacher, I should teach my students how to think and explore science as well

as how to develop their problem-solving skills. I do not think teachers in Canadian classrooms make any definitive claims because the process of the inquiry is more important than the answer to the question.”

Jennie and physics. Jennie recalled the scene when she first entered a Canadian high school: it was a lesson about friction. When conducting physics experiments in Chinese classrooms, students always follow teacher’s instructions. Jennie recalled that when she did the friction experiment in China, she just repeated what the teacher did, which she found to be boring. However, in Canada, when the teacher explained friction, she applied the lesson to a practical example the student would be familiar with: the soles of sports shoes. It is said that each company has a large amount of money invested in the soles every year, and the fundamental thing is to study the friction of the sole. Then the teacher grouped the students in the class, and then let the student select one shoe from each group. The teacher joked that this might be a smelly experiment. Then the students tested the friction of that shoe according to the normal experimental method. Because the teacher related the lesson to a practical example the student could understand, included peer-to-peer learning by making it a group exercise, added humour, and encouraged the students to explore the subject themselves, their curiosity was piqued and they were more engaged in the lesson.

In a later conversation, Jennie reminisced about the lesson: “I like this lesson because I feel it is like a workshop that allows teachers to share their knowledge with students while encouraging students to acquire knowledge.” She recalled this scene, stating that she had not had a similar experience since and that “such opportunities come by chance”. She said that she would learn the teacher's pedagogical models and methods

so that she will be able to stimulate students' curiosity and interest in learning in her future class.

Zelda and biology. When observing a lesson on seed germination, Zelda saw the benefits of encouraging students' curiosity rather than simply lecturing them. In the lower grades, the students were required to do "seed germination experiments." By conducting experiments in person, they were able to observe the whole process of germination of a seed and understand the conditions required for seed germination. At the same time, through the teacher's proper guidance, the students also became curious about what substance was causing seed germination and seed maturity. Zelda reported that in the upper grades, students learned relevant professional knowledge. Through learning, they came to understand the control variable method contained in the seed germination experiment, the relationship between biology and the environment, and the necessary conditions for seed germination. After having seen this, Zelda expressed that she wished she had had the opportunity to do such an experiment so as to develop an understanding of the science behind this phenomenon. Zelda stated that in Canada's primary and junior grades, students will witness the scientific phenomenon through experiments, understand the wonders of science, and thus be curious about and have an interest in science. In the upper grades, students will learn more professional knowledge and understand the meaning behind scientific phenomena.

Knowledge application. One of the similarities that the participants identified between the teaching models used in China and Ontario is the focus on the practical application of lesson content.

Jennie and physics. Jennie said that "Education should originate from and be

applied to life” and found that “Canadian Physics textbooks do not focus on difficult and systematic concepts since students may not use the specific knowledge learned in high school in their daily lives in the future.” This, she found, was consistent with “the new curriculum reform in China”. This was consistent with the lesson on friction, which involved the shoes the students wore. Jennie concluded that this approach was beneficial because “Life is education, which implies that education should originate from and be applied to life.”

Jennie felt that this approach was best exemplified in a grade 6 science lesson in which the teacher taught about the function and uses of horizontal force. It was interesting that the teacher asked if there were any students who had an iPhone. Then he asked the student to open the compass function and told the students to put the phone on the wooden board. At this time, the small pointer and the big pointer ran parallel. This meant that the object being tested were horizontal. Jennie feels that the teaching aids used by the teachers in the class are everywhere in life and closely related to students’ daily life. After the class, Jennie said, “When I become a teacher, I will do my best to apply what I learned in his class and become an excellent teacher like him”.

Zelda and mathematics. Zelda noted that the teachers use some practical, everyday objects when teaching students numeracy, such as coins, labels, and stickers. She outlined her process: “When tutoring a student “ $8 + 9$ ” in the after-school program, I have the student count different objects several times. The Western approaches to basic education that I have seen typically focus on practice and the students’ experiential education, and students are guided to learn from the concepts and gradually learn deeper. When teaching theory and concepts, teachers in Canada are always connecting it with

students' experiences and give many real-life examples.” Based on these observations, Zelda expressed a desire to utilize this approach when teaching in China by linking theoretical concepts to practical, real-world examples that students are familiar.

Pauline and geography. Pauline asserted that environmental education is a critical component of the study of geography and of students' daily lives. Pauline reported that the geography teacher asked the students to imitate the water cycle, and then the teacher dropped “contaminants (ink)” into the “marine system (sink)” to allow the students observe the results. The students concluded that the pollutants will eventually penetrate into every part of the water cycle, and the students came to understand that the damage caused by water pollution is serious. The teacher then asked everyone to go back and collect the reports of water pollution, and let the students share the information they found in next class. She believes that teachers “need to cultivate students' awareness of the importance of saving resources and protecting the environment.” When observing classes in Canada, she attached significant importance to environmental education and found that “Canadian society has devoted itself to the cause of environmental protection and formed a social concept of honor and disgrace, and reinforces the belief that it is very shameful to harm the environment and be wasteful.” Though Pauline believes that China's geography education also attaches importance to the environment, she suggests that the degree of emphasis is significantly lower than what she saw in Canadian classrooms. In China, she notes that this focus takes “the form of proposed environmental protection measures” and clichéd platitudes such as “Don't litter” or “Go out less”. She concludes that without a more comprehensive focus on environmental protection in classroom, China fails to sufficiently promote respect for nature and the environment.

Based on her observations of the classrooms in Ontario, Pauline decided to “design an environmentally-friendly topic that combines geography, biology, and chemistry” in her future classrooms so as “to create a multidisciplinary classroom that explores science in a concrete way” that promotes “environmentally friendly practices and encourages students to understand why do we need to cherish resources and protect the environment.” Through such efforts, Pauline expressed a hope to contribute to environmental protection.

Holly and chemistry. When observing a Grade 10 chemistry class, Holly found that the Canadian chemistry class was strikingly similar to a Chinese chemistry class. In this model, the teacher explains the content and sometimes write some key points on the board, while students sit in the classroom and are expected to take notes. In her six-week high school chemistry classroom observations, the class did not relate to real life. Before she came, she thought that the Canadian chemistry curriculum may advocate for “vivifying chemistry,” by which she meant connecting chemistry to everyday life and explaining common phenomena through a chemistry perspective. However, the class she observed seem to focus on rote learning, like those she saw in China. In contrast, she heard from other chemistry pre-service teachers that the chemistry classes at other schools were more interesting. Her colleagues, she noted, agreed that chemistry is a subject that needs to relate to the students’ lives so that students are intrinsically motivated to learn because they find the information useful. Holly noted that her classmates all were influenced by the notion that chemistry is a subject that firmly connects to nature, which is emphasized in the pre-service teacher education program at

the University of Windsor. She said that she was disappointed she did not have chance to see other schools.

Pedagogy of science teaching. Though each student was interested and engaged with theory, each participant was also focused on how their experience in Ontario would help them connect theory with practice.

Jenny: Theory and practice. When asked about how science education differs in primary and secondary schools in China and Ontario, Jenny reported that the use of experiments differed significantly. In China, students attend a theoretical class in a conventional classroom that does not have lab equipment and may sometimes have an experimental class afterwards in an actual lab. In this context, student may simply watch the teacher do an experiment as there are limited resource and thus do not always have an opportunity to do an experiment themselves. Alternately, science classrooms in Ontario are conducted in a lab and they combine theory with experiments. In this context, there is no clear distinction between theory and practice, especially in high schools. The teacher leads of the experiment and students usually follow along at their own station. Through the 6-week high school physics class observation, she found that each class is combine theory with practice and students also said that this makes the physics class vivid. Therefore, she concluded that after she became a physics teacher, she will follow the Canadian physics teaching pedagogy and teach in the laboratory. However, she also mentioned that China's laboratories are limited, but she believes that she will try her best to let students learn in the operation of limited resources instead of just read the textbooks in the classroom.

Holly: Theory and practice. During a workshop offered by the university that hosted the exchange, Holly reported that she was most impressed by the fact that the professor hosting the workshop was not confined to the classroom. For example, when framing a science lesson about the growth of trees, the professor suddenly he suggested that the group of pre-service teachers go outside to observe what happens to the trees outside in their natural environment. Rather than simply telling students about the growth of trees, showing the shoots, leaf stalks, flower buds, and other manifestations of growth on an actual tree can frame such a lesson in the real, observable work. Holly concluded that the professor's approach was more immersive than just telling students about topic and encouraged students to learn through observation rather than accepting what they hear as truth. This led her to conclude that Canada schools have truly combined lesson content and theory with practice.

Pauline Theory and practice. Pauline stated that Chinese geography lessons relied heavily on text-book and that students consequently may not have a proper conception of topics such as terrain. However, like Holly, she observed that the Canadian teachers may take a class outside to create concrete connections between text book and students' real-world contexts. For example, every semester the school takes students on several field trips. Each outing has a specific topic or theme and usually involves activities. For example, on one field trip, the students went to an art gallery where they could observe and be immersed in art, but their next trip focused on geography. The teacher will review their experiences on such trips to make connections between what they experience and what they learn in class. In China, such outings are taken more as a casual day and not a learning experience and when out students cannot participate by

asking questions as they must follow strict rules. Having observed the alternative approach used in Windsor's schools, Pauline decided that she would employ this pedagogical method in her future science teaching.

Zelda Theory and practice. In a STEM class, Zelda noted that the teacher asked the students to design and create a device that uses air pressure to push a propeller so as to move a ping pong ball, but the teacher did not tell the student theoretical knowledge and the concrete operation process; he just gave the materials to the students and then separate the students into different groups. When the students finished the work, the teacher explained the working principle of the device, which left a deep impression among the students. Zelda indicated that this was contrary to the approach used in China, where teachers will introduce the theoretical knowledge first, and if there is an exercise, which itself is unlikely, the teacher will provide the students with step-by-step instructions and offer a template for the students to imitate. This, Zelda noted, removes the critical and creative engagement and leads to all the students producing the same product in the end.

Theory and practice: Takeaways. As future science teachers, pre-service teachers need to be able to teach theoretical knowledge, but they also need to fully understand the practice in order to successfully combine theory and practice in the information age. While it is important to have a theoretical foundation when entering the profession, it is equally important to have the ability to help students' practice. Practical activities related to theory not only help students learn; they also help them apply knowledge in the future.

Student assessment. Though each participant was interested in student assessment, they were also focused on how their experience in Ontario would help them improve student assessment in future applications when they returned to China.

Holly and chemistry. The teacher gave students greater autonomy in terms of test time and group-member selection. For instance, the chemistry teacher she was observing realized that some students had a biology test in another class on Monday, the teacher allows students to vote as to whether they would have their chemistry test on either the Friday or following Tuesday. The teacher also assigned students into study groups using a diplomatic and democratic approach: each student wrote the names of the four students who they most want to study with in order of preference. By calculating the preferences, the teacher then created the groups. However, to encourage students to learn from different students and get different perspectives, these groups were changed after each unit. Based on this experience, Holly decided that “Giving students more autonomy” with respect to testing and participation was something she wanted to employ in her future classrooms.

Jenny and physics. In the physics class that Jenny was observing, she noted that the preparation approaches the teacher used was different than those used in China. In Chinese classroom, teachers employ test-sea tactics (题海战术). These approaches include having students learn through repetition by repeated writing and solving similar questions in what seems like a ‘sea’ of mock test. However, Jenny observe that group discussions are used in Canada. For example, in advance of a comprehensive test on force, the teacher handed out a “test discussion page to” each of his Grade-11 student. This, she observed, was common practice: “every time before the exam, teacher will send

a test discussion page to the students.” The test discussion page provided a description of the applications that would be featured in and covered by the upcoming test. The discussion page usually encouraged peer-to-peer learning through specific instructions: “With your group: 1. Decide on the key events for the problems. 2. Explain to each other the physics that takes place with a focus on forces.” Students were allowed to write notes on this page and keep it for the individual part of the test; however, the content written by the student on this page would not be counted in the final score.

After ten minutes, the group members who had completed their discussion would receive the test and would begin writing it. Though the test had multiple-choice questions, the application question was the refinement of the test discussion page and added specific values for the students to calculate. Jenny thought the test discussion page provided a novel and inspiring approach. First of all, without the influence of data, students were encouraged to focus more on the nature of physics, which allowed them to more deeply analyze the motion process and stress of objects. This allowed the students to strengthen the connection between physics and life in this process, deepening their understanding of physics, realizing that they should focus on understanding and not just “calculating results”. Secondly, this approach gave students physical scenes through which they could exercise their ability to discover and extract key points and information. When students encounter a large number of application questions, they often do not know how to examine and begin questions. Jenny noted that “Physics exams often contain a lot of background knowledge and distracting information, which is why many students find physics questions difficult.” Thus, she observed, teachers will consciously encourage students to assume that they are the teacher after reading the topic so as to strengthen

their sensitivity to the key information of the examination questions. Based on these observations Jenny concluded that putting aside specific data allows students to have a similar role through discussion and analysis, and allows students to develop problem-solving thinking through their own subjective judgments. Furthermore, she reported that the Canadian physics teacher explained the value of this approach: “in the form of group discussions, the students can understand that they are also part of the group. Students learn from each other in the exchanges and complement each other to achieve the effect of filling up the gaps.” Jenny thus found group review to be an effective way to learn. Most of the teachers have moved beyond the level of student's understanding and thus may not understand or be able to anticipate students' confusion. Therefore, when students fail to understand an element of a lecture, this content may be ignored during the test review class. However, based on her experience, Jenny learned that group discussion can focused on these problems, allowing students to identify and solve problems with each other on their own terms. Jenny thought this approach was an effective method of review that would allow them to master knowledge by that is more accessible through peer-to-peer review rather than an instructor's lecture.

Although constraints relating to class size and time limits may make it difficult for Jenny to utilize test discussion to prepare for future exams, Jenny noted that she will use it in common exercises. It is more important to establish students' physical thinking and elaboration and build up students' physical thinking so as to help them understand the intention of setting the questions. This can be more effective than forcing students to do questions through China's test-sea tactics. Physics not only require students to develop computing skills but their ability to solve problems and understand phenomena.

CHAPTER 5 DISCUSSION, CONCLUSIONS, AND IMPLICATIONS

Discussion

Though outlining the results and findings of the data collection provides important insights into the value and impact of exchange programs like the RLP as it applies to science teaching, it is critical to discuss the participants' shared cross-cultural beliefs, reflections, and cross-cultural learning experiences in Canada. It is likewise important to discuss how participation in the program changed the participants' perception of science teaching and how being exposed to two educational systems and living in Canada inspired them to revise their teaching philosophy. Based on a discussion of these theme, recommendations can be made to promote the development of science pre-service teacher education programs in Canada, particularly at the University of Windsor.

Participants experiences and challenges. The participants experienced a number of challenges on their exchange, including homesickness, language barriers, issues relating to time management skills, isolation, and struggles with integration.

Homesickness. According to Zhang and Zhou (2010), international students often do not have close friends to associate with in their spare time, and as a result, homesickness and loneliness are common challenges for them. This was consistent with the experiences of the current study's participants. At the beginning of the exchange period, most of the participants reported feelings of loneliness and homesickness in relation to a lack of social relations and their struggles with living independently. The participants went onto state that watching the Canadian families around them reminded

them of and caused them to miss their own families, intensifying their feelings of loneliness.

Language barriers. Zhang and Zhou (2010) go onto note that one of the major challenges for the international students is their weak English language proficiency, which affects their acclimatization to the new learning environment. Participants also identified language barriers, especially oral communication in English, as the central reason they were not able to socialize with Canadians and integrate into campus at the University of Windsor. Using the framework of Dalton et al. (2001), language self-confidence can be seen as a response resource. Although no studies have investigated the language self-confidence of self-awareness among international students exchanged in Canada, Pak, Dion, and Dion (1985) found that English self-confidence and self-esteem are positively correlated with personal control perception and satisfaction with life. This assertion was validated by the participants, who stated that a lack of language self-confidence led them to speak almost exclusively with Chinese exchange students, though they did sometimes communicate in English. Because exchange students spend insufficient time abroad, it is difficult for them to improve their language skills.

Time management. Because the Chinese pedagogical model places an emphasis on test taking and knowledge building, parents and teachers implement a heavily regimented schedule for students that leaves little time for them to do anything outside of their studies. As a result, students do not have an opportunity to see the advantages of independent study or develop time management skills. When placed in a Canadian learning context, their previous experience posed a number of problems, both with

respect to their understanding of Canada's pedagogical model and their own ability to navigate their studies.

Length of school day and homework in Ontario. A key issue was that participants did not see the value of the short duration of the school day that are common in Ontario's classrooms and they were shocked to discover that there were a limited number of homework assignment in Canada. This inhibited their ability to see the value in such approaches. Therefore, it is important to understand the Canadian education model, namely that the Canadian system gives students more time after school to build their own interests and engage in independent learning (Campbell, 2015). This can foster retention as the motivation for independent learning is typically intrinsic.

Time management skills. During their stay in Canada, the participants were not given a strict, regimented schedule, and as a result, many struggled to effectively manage their time. This was particularly an issue because their peers in China continued to take work-intensive courses, and so those who sojourned to Canada were at risk of falling behind in their peers. This was compounded by the fact that there was far less pressure to study in Canada, and instructors provided almost not direction with respect to time management. Thus, it was easy for the exchange students to struggle when trying to maximize their time. Thus, they are more likely to misuse the free time they do have. This is consistent with other research on international students. For example, Wang (2016) found that Chinese international students were likely to drop out of their programs because their poor time management skills inhibited their academic performance.

Isolation and integration. Research has found that although university performance is the most significant predictor of a student's decision to leave or stay,

integration will influence a student's goal of degree completion and commitment to the institution (Zhou & Zhang, 2014). Integration entails that a student fits into the cultural environment and is determined by factors such as informal peer group association, interaction with academics and staff, and semi-formal extracurricular activities. Isolation was also a central issue that the participant struggled with, which was compounded by the fact that it was difficult for them to integrate into the host culture and community. A possible explanation for poor integration can be attributed to language barriers and culture shock, as well as the different instructional context and requirements (Zhou & Zhang, 2014). Because the students were separated from their friends and family for the first time in their lives, they each reported feelings of loneliness and isolation. This was exacerbated by the fact that they were immersed in an environment that was alien to them culturally and where language barriers made integration difficult. This also led to feelings of sadness and depression. This was made more difficult for the participants because integration into the host culture was challenging due to the structure of the RLP. Where typical exchange programs have students participate in courses and complete exams alongside students from the host culture, the RLP participants focus strictly on observing the Canadian classrooms.

Though the challenges associated with culture shock can be trying, they have the potential to be positive experiences that promote transformative learning and personal and professional growth for the students. Byram and Feng (2006) argue that cross-cultural experiences are more likely to significantly change people and provide them with educational experience in other countries, which will be more intense and richer. This is consistent with the current study, as the cross-cultural experiences of Chinese science

teacher candidates influenced them, teaching them how to handle their approach teaching with different strategies to make their teaching style more diverse and engaging. Thus, it is important to note that the culture shock and similar issues that lead to feeling of isolation, loneliness, and depression should not be avoided but rather made to be more manageable.

Impacts of exchange program. Most participants agreed that this trip was valuable. Though they initially had homesickness and limited English language and time management skills, they managed to overcome these obstacles and learned numerous teaching methods that have the potential to help them become qualified science teachers in the future. These Western pedagogical methods encouraged the pre-service teachers to apply theory to practical setting, which is a tool they can use to stimulate their future students' curiosity. Most participants agree that this trip is valuable that will influence their approach to teaching.

Revising teaching philosophy. According to Xu (2015), the RLP offer pre-service teachers an opportunity to challenge their preconception about teaching and revise their teaching philosophy. As the world becomes increasingly globalized, it is critical that teachers be able to both navigate an education system that is shaped by globalization and prepare their students to thrive in this context. However, China's current pedagogical model is limited in this scope. Thus, participating in an exchange program that encourages teachers to use a more diverse and global pedagogical model is critical.

Coming from a Confucian pedagogical model, the participants attached significant value to rote learning and teacher-centered approaches; therefore, they were shocked to see a pedagogical model that seemed to devalue rote learning and focused

instead on student-centered approaches. In China, they came to value one-way auditory learning in the form lectures and exam orientated assessment. In Ontario, they saw that teachers used reciprocal auditory learning approaches that involves student speaking out or questioning teachers, as well as visual and tactile/kinesthetic learning approaches. Moreover, instead of exam-orientated assessment, the teacher relies on multi-assessment tools. Outwardly, these approaches did not seem to promote learning in the way that they had conceptualized learning; however, after being exposed to these styles for a longer duration, they came to value them. They saw that Canadian students who struggled to answer questions or excel on tests performed better when being evaluated with different tools, and that repeating lecture content with visual aids or reinforcing it with exercise promoted student learning. Moreover, they saw that students who excelled on test struggled with other areas of assessment. This allowed them to recognize that the visual and kinesthetic learnings in China may be neglected and that the Chinese model, though efficient in many respects was limited. For example, rather than maintaining a rigid commitment to China's Confucian model, Jenny stated that "it is essential for science teachers to be able to find ways to improve students' engagement in relatively boring science class" by incorporating more activities and hands-on learning. This goes for attitude as well. For example, Pauline noted that her own teachers in China were stern compared to their Canadian counterparts. The teacher she observed "had so much energy and passion that every student was smiling all day," which is an approach she hopes to bring back to China.

This is not to say that the participant rejected the Chinese teaching model. For example, Jenny said that she plans on combining her "own original teaching philosophy,

because it is not enough to focus on the students' hands-on ability, and the students' mastery of theoretical knowledge is equally important.” This was consistent with each of the participant, who reported that Chinese and Canadian education systems should overcome their respective weaknesses by incorporating the advantageous elements of both teaching approaches. Moreover, they participant noted challenges in the Canadian schools that were not present in Chinese schools. For example, though Pauline learned different approaches to the “content, speed, and environment of the classroom,” she found that many students did not concentrate on listening to teachers and instead were distracted by their smart phones. Moreover, she was alarmed that teachers did not seem to care about this issue and often just continued teaching without addressing the issue. Thus, she saw the value in a teacher-centered approach where students respected the teachers more and teachers had more authority in the classroom.

According to Kagan (1992), classroom observations and teaching internships in Canada help personal and professional development of teacher candidates. The participants’ growing respect for Canadian culture and social environment has contributed to their personal and professional progress. Initially, the observation and teaching practices of local schools were an important part of their internships in Canada because participants’ experiences in China were different from those they had in Ontario. Thus, because of the gap in the participants’ cross-cultural understanding of education, exchange programs like the RLP are necessary as they promote a more global approach to education that will better prepare pre-service teachers, who can pass their more global approach onto their future students, thereby preparing them for the globalize markets they will likely enter.

Transformative learning. In order for the participants to see a genuine change in their teaching philosophy, the learning experience they have in the exchange program must be transformative in nature. Firstly, the participants should challenge their own context. According to Wu, Garza, and Guzman (2015), exchange students may not agree with Western teaching philosophies, which may not make sense to their own cultural context. Despite this, exchange student much try to understand the pedagogies by examining them form a different perspective, which requires asking critical and reflective questions and reserving judgment. This was consisting with the current study's participants, who found that Canadian students have less homework and who were quick to criticize this teaching method. However, it is essential that the participants understand the purpose of this approach and challenge their own perspectives. Studying abroad provides participants with the opportunity to gain a different perspective both with regard to academic subjects but their personal world view. Whether understanding the merits of shorter school days or learning about student-centre approaches, study abroad programs allow participants to look at themselves, their world, and their academic views from a different perspective (Messelink, Van Maele, & Spencer-Oatey, 2015). As part of this process, participants should engage in self-reflection by writing reflective journals and having critical discussions with peers and mentors, either in one-on-one or group contexts. For pre-service teachers, the transformative learning demonstrates the importance of engaging participants in classroom practices that help to develop critical reflection through the use of reflective journal and critical discourses. Lastly, transformative learning leads to a change in thinking and behavior (Taylor, 2017). The current research revealed that participants have changed their teaching thinking, but more

importantly, people need to see the transformative learning third dimension: their behavior changes when they return to China. This, however, rests outside the scope of the current research. Thus, this is an element that future should explore.

In my research, transformational learning motivated participants to become their own advocates as it forced pre-service teachers to expand the boundaries of self-awareness and apply the necessary skills of critical thinking and analysis. Clear goals are required to overcome initial barriers in the process of accepting cross-cultural education; therefore, it is critical to set a timetable to achieve goals. The process of change has transformed the identity of the science teacher candidates. They did not only come to Canada for education; they also came to critically reflect on Canadian education from different perspectives (Laros et al., 2017). When the participants return to China, they will ideally insist on transformational learning in their future studies and work for both themselves and their students.

Personal development and expanding world view. The participants' cross-cultural learning and life experiences in Canada provided a number of other benefits that have the potential to enhance their professional growth as science teachers by promoting personal growth. For example, they learned about the importance of creating an inclusive and accommodating classroom that supports all students with respect to abilities and cultures.

Learning disabilities and exceptionalities. In China's teacher-centered culture, when students perform poorly, this performance is often attributed to a lack of effort from the student; however, a more global view would typically frame these struggles as the result of a learning barrier or exceptionality. Though the current study's participants

seemed critical of Canadian students who did not apply themselves to their studies as rigorously as most Chinese student do, and though they expressed disapproval of some Canadian students' engagement in class, they came to realize that these different approaches did have value and helped address the varying needs of a group of diverse learners. Likewise, though they were unsure as to the value of some student-centered approaches, their time in Canada encouraged them to be more aware of students' needs and teachers' potential limitations. Tomalin and Stempleski (2013) argue that teacher education needs to provide teachers with courses on dealing with diversity in the classroom and professional development related to teaching in a multicultural setting, which can help them learn more about the different needs of students and develop teaching skills to support second language learners. This diversity also applies to the diverse learning preferences of students. Though auditory learners may easily excel in China's teacher-centered schools, visual and kinesthetic learners may struggle; thus, it is important for teachers to critically reflect on their own performance. For example, instead of seeing students' struggles as a deficiency in the student but rather in their teacher model. This requires teachers to be criticize their own system and the education system itself to examine its model, drawing on global examples to create inclusive classrooms that support all students, regardless of their preferred learning style or learning exceptionalities. The RLP has allowed the current study's participants so understand that student outcomes are predicated on both the students' efforts and teachers' pedagogical approaches. Thus, it is critical that teachers must support students with learning disabilities/exceptionalities and develop programs to achieve this end: by learning from

the insights participants in exchange programs gain, China can eventually modify its current model to be more inclusive.

Culture. Though some might see Chinese classrooms as being overwhelmingly homogenous, its classrooms do feature ethnic diversity that can shape student engagement. For example, Chinese often include Han students, who are members of an ethnic minority in China. Just as Canadian teachers must create an inclusive classroom that is welcoming to students from a variety of ethnically diverse backgrounds, so too must China's teachers foster an inclusive environment that empowers students from ethnic minorities like the Han. It is also critical for teachers to transfer the cultural sensitivity to their students because, in a globalized world of interconnected and cross-national communication of ideas and people, these students will need such skills if they are to be able to adapt to and thrive in the globalize world. Thus, it is essential for Chinese schools to adopt this approach as local institutions are responsible for educating students to be global citizens and embody the global-local debates of educational reforms both in the East and the West (Tudball, 2005).

This multicultural approach defines Ontario's curriculum, which articulates that students should understand a diversity of beliefs and values of other individuals and groups in Canadian society. Likewise, Salisbury, Umbach, Paulsen, and Pascarella (2009) note that China's education policy advocates cultivating students with global understanding because education is no longer an exclusive business within nation states. This means that schools must cultivate students' global perspectives to make them more competitive while at the same time enhancing China's competitiveness. In this way,

programs like the RLP can help future teachers improve their global awareness through mutual learning in China and Canada.

Conclusion

To clearly delineate the conclusions of the research, it is important to revisit the research questions:

1. What cross-cultural experiences and challenges do Chinese exchange students encounter in the RLP?
2. How does participation in this program influence their perceptions about science teaching?

With respect to the first question, it is clear that the Chinese science exchange students have encountered many cross-cultural experiences and challenges in Windsor. When asked about their experience from China to Canada, there were three challenges in the participants' responses: their initial homesickness and isolation, limited English language proficiency, and time management. I believe that sharing their experiences in Canada will definitely play an invaluable role for future exchange students and China's science education reform.

With regard to the second question, the data suggests that the program has profoundly influenced their views on science teaching. During their time in Windsor, science education has always been on the mind of the participants as science pre-service teachers. Through the international exchange program, they learned how to possibly change perspectives about science education by stimulating students' curiosity, using knowledge application, changing the pedagogical approach to science teaching, and re-assessing student assessment.

Thus, the participants' cross-cultural learning and life experiences in Canada provided a number of other benefits that have the potential to enhance their professional growth as science teachers by promoting personal growth. For example, they learned about the importance of creating an inclusive and accommodating classroom that supports all students with respect to their abilities and cultures. This highlights the value that exchange programs like the RLP offers students who participate in exchange programs.

Implications

Central factors were prevalent in the current study' data: participants struggled to deal with isolation, they likewise struggled with time management, and transformative approaches effectively reinforced the goals of the RLP. With this in mind, it is critical that the RLP and similar programs need to streamline the preparation process so as to reduce the struggles and promote transformative learning within the program.

Homesickness. To address homesickness, the participants employed several strategies. For example, they adhered to a popular Chinese maxim that instructs students to “disregard the window and focus on one thing.” This expression was used in schools when students would be distracted from the teacher's lesson by what was going on outside of a window. Thus, instead of allowing their homesickness to distract them, they focused on their school work. This, however, only helped when they were in class. Shifting attention to learning was thus considered an effective way to alleviate homesickness. After all, the purpose of exchange is to enable participants to make continuous progress and improve. To overcome their loneliness when at home, they kept in touch with family and friends back in China. Communicating with family and friends

every week by texting with them through social networks such as WeChat, sharing video chat on their smartphones, or email, they were some of the ways that participants eased their homesickness. Even though the participants and their families knew they were far apart, they were happy to keep updated on daily events. Knowing that friends and family were thinking about them also helped to ease this burden.

To further address this issue, the RLP can offer workshops on mental health that give students methods they can use to combat isolation and feelings of sadness. For example, the workshop might encourage the sojourners to regularly communicate with family and friends every week. This can help to highlight potential issues before they become a problem and equip students with the tools to be critically self-aware of how mental health issues impact them and how they can overcome feelings of loneliness, isolation, sadness, or depression. When the RLP sets up the orientation, it can also connect student with Chinese culture spots, such as Chinese grocery stores, restaurants, tea shops, or community organizations and gatherings. They might also offer group bus ride to these locations if transportation is a barrier. This will allow the students to maintain some of the cultural practices they may otherwise miss, helping them reduce feelings of loneliness.

Isolation and integration. Mental health issues in China are stigmatized, and as a result, many Chinese people are ashamed of or in denial about their mental health problems. Thus, when exchange students come to Canada and experience mental health issues, such as loneliness and isolation, they may be unwilling to admit to the issue or to seek help for it. To address this issue, the RLP and similar programs must include mental health education as part of the pre-departure training. This will ensure that future

exchange students know about the potential mental health issues that they may encounter in Canada in advance. Moreover, it is critical that all exchange programs provide mental health support and counselling services and teach student how to utilize such services during orientation while encouraging them to take advantage of these services.

According to Canadian Bureau for International Education (2015), to promote integration, the program should consider a more integrated approach to student engagement. The most common recommendation for the program is to create and facilitate more inclusive opportunities for international students and Canadians students, fostering greater, multi-level exchange. For instance, they should offer exchange students access to graduate education classes with Chinese international students to help them feel more comfortable and build connections. It is also critical that the exchange students actually participate in classes, finish assignments, and earn some credits, rather than just taking notes when they observe the class. This is of particular importance for per-service science teachers; thus, the RLP should prepare more subject-related science courses for them to participant. Only by truly participating in Western academic life in Ontario can they understand the pedagogical differences between Ontario and China's science classrooms. Even though the pre-service students may not pursue graduate studies, being exposed to graduate-level courses will encourage them to develop critical thinking and the ability to learn independently, which will promote the transformative learning that the RLP set out to achieve.

The Canadian pre-service teachers who visited China face similar challenges but were provided with peer support in the form of Chinese pre-service teachers who helped them navigate their new environment. This is similar to programs that the University of

Windsor currently has to first-year undergraduate students, who receive mentorship and guidance from upper-year peers (Student Success and Leadership Centre, n.d.). However, despite the obvious advantages of such programs, the Chinese pre-service teachers who visited Canada through the RLP were not offered consistent or extensive peers support in a similar fashion. Implementing a similar program for these students might help to facilitate their integration and ease feelings of loneliness and isolation. The University of Windsor might consider recruiting domestic volunteers to act as peer advisors, or may even consider recruiting volunteers from their own international Chinese students, ideally those from the Masters of Education program since they share a common language and discipline.

Language barriers. In order to avoid the language barriers, students who will participate in the international exchange program in the future should learn the host language of the country they will be visiting in advance. Moreover, as each academic discipline has its own unique lexicon, exchange students should review the syllabuses of the courses they will be involved with to ensure they are familiar with relevant subjects and vocabulary. This is particularly true for science pre-service teachers as science courses have numerous proper nouns that are not common to the core language. Therefore, each pre-service science teachers should preview the syllabus of the course they will be participating in prior to departure and learn the scientific lexicon associated with the class. It might also be helpful to develop a list of those words both in Chinese and English for reference. This can ease their language transition.

Time management. Based on a review of the current literature and the data collected from the current study, it is clear that many exchange students lack time

management skills. To address this issue, exchange programs should consider several options. Firstly, the RLP should offer time management workshops to visiting students upon their arrival and highlight the challenges these students can expect to encounter and the tools they can use to address them. Being aware of such challenges before they become an issue will help to better equip the students with the tools needed to overcome these issues and succeed. To motivate the students to put these time management skills into practice and prevent them from falling behind their peers back at SWU, they might also consider having the students continue their academic work through a distance education program. For example, the visiting science students might be assigned an assignment each week and have to submit it via email to instructors back at SWU for science exchange students to catch up their Chinese curriculum process. These assignments would be particularly beneficial if they encouraged science pre-service teachers to explore how these new pedagogies can be applied in science classrooms to enhance student engagement, motivation, and outcomes. This will provide them with a firm schedule, but one that is less regimented, giving them a transition between the Chinese and Canadian approaches to time management and ensure future program participants keep up with the material their peers at SWU are learning while compelling them to use their time management skills.

Transformative learning. Past research and the current study have found that exchange programs are most able to achieve their goals when students engage in transformative learning; however, in order for students to be able to experience transformative learning, they must first understand how it functions. Thus, a significant component of the pre-departure training should focus on teaching the exchange students

about transformative learning. Moreover, because transformative learning is built upon critical self-reflection and critical engagement, exchange students must develop these essential skills. Unfortunately, China's teacher-centered learning has promoted more passive learning approaches, such as rote memorization. Therefore, the transformative learning lessons should ideally include workshops and exercises that have students engage in and practice critical thinking so as to hone these skills before they begin the exchange program. This will allow them to play a key role in the overall communication process, which is essential because it allows participants to critically recognize that they tend to be reactionary. Without this awareness, when they come into contact with practices and concepts similar to them, they may not critically engage with these new perspectives. For example, when an instructor in a teaching-centered context sees a Canadian student go to the washroom without asking, they may think that the student is misbehaving. In addition, when students are assigned group activities instead of relying exclusively on lectures, they may think that this method is an inefficient use of class time. However, participants in the exchange program need to ask questions about these approaches to determine their purpose rather than dismissing them. They must also observe the learning outcomes of these practices. When teachers explain their teaching methods, participants must listen carefully to them so that they can ask follow-up questions. This approach is more likely to lead to a transformative experience than teachers who simply reject practices, criticize practices, or promote their teaching preferences and perspectives.

In addition, as transformative learners, pre-service teachers must be willing to critically examine and question their understanding of education and the pedagogy they

use. To do this effectively, science pre-service teachers must first understand how the Chinese science education system works, why it is designed in the way that it is designed, and understand that it does have to be rigorously tested and challenged. Once established, science pre-service teachers must ask Canadian educators about their views on science education and pedagogy, especially student-centered teaching methods. This will allow Chinese science teachers to move away from an overreliance on lectures that students are expected to simply memorize. Instead, these science teachers can promote critical thinking through kinesthetic approaches, such as science experiment, or personal reflections that ask students to consider how the themes and concepts discussed in science lessons apply in their daily lives and practical settings. If these views are contrary to their own views, they must not only critically consider the value of these ideas, but also what benefits it offers. Similarly, they may also ask the moderators what restrictions they see in teacher-centered teaching, which were used to teach and utilized by pre-service teachers in China. When my participants engage in this critical thinking and use important lines of inquiry, they will be able to develop a more detailed and comprehensive understanding of their own science teaching methods and comparative teaching methods used in the West, which can promote their transformative learning. Moreover, when they apply these methods in class and critically reflect on their application, they can further enhance them and make changes to them so as to ensure the accommodate the context of a Confucian learning environment.

Theoretical training. To facilitate their transformative learning, it is critical that Chinese exchange students be familiar with the theoretical models they will encounter in Canada so that they can identify them and engage with them critically. For instance,

Chinese students know that the Western education model is student-centered, but they lack practical experience with this model and an understanding of its benefits and purposes. Therefore, in order to achieve the purpose of transformative learning, the exchange students must understand the models before seeing them; otherwise, they may simply have an uncritical, reactionary response to witnessing the pedagogical approaches use in Canada that are divergent from and sharply contrast those used in China. For example, exchange students who do not understand the nuances of a student-centered approach may simply dismiss students who speak out in class as disruptive and may see group work and discussion as a waste of class time. However, those who have already learned about student-centered approaches will be able to identify the purpose of these methods and critically reflect on whether they are achieving their intended purpose. Likewise, as most students in China have been evaluated almost exclusively through an exam-oriented process, they may not understand the merits of a multi-assessment approach. However, when they learn that multi-assessment tools are utilized so that students with different learning styles have an opportunity to convey their understanding of lesson content in a way that is consistent with how they naturally express themselves, then they may see the value of such an approach. Thus, if teachers based their evaluation of students on class participation, group work, or exercises, the exchange students may be dismissive of these approaches due to the perception that they lack consistent and quantifiable measures. However, if they learn about the potential limitations of exam-orientated assessment and the value of including multi-assessment approaches, they will be able to critically evaluate and reflect on these assessment tools when they see them in a Canadian context, instead of dismissing them outright.

This is critical in science learning, particularly in China, where science learning has been dominated by teacher-centered approaches and exam-orientated assessment. If the RLP exchange students are dismissive of these approaches due to a lack of understanding, they may be disinclined to import these Western pedagogical models to China upon their return, meaning the program would have been a wasted opportunity. However, if the exchange students are able to critically evaluate such approaches and see their merits, they may experience transformative learning that encourages them to incorporate student-centered learning approaches, such as experiments and group work, as well as multi-assessment approaches, such as practical exams and participation, to enhance their students learning and cognitive skills. This can improve both their teaching and assessment strategies. Rather than relying exclusively on auditory learning via lecture, science teachers can incorporate kinesthetic approaches, like science experiments, and assigning them as group work would encourage peer-to-peer learning, rather than a more teacher-centred approach. Moreover, the results of and the data collected from these experiments can be included as a mode of assessment, demonstrating to students the importance of application and creative and critical thinking. This would challenge the conventional belief that rote memorization is the only learning method that warrants reward.

Therefore, it is critical that exchange students are provided with an in-depth overview of these pedagogical models prior to departure. As these are complex theories that may challenge their world view, a single workshop may not be sufficient. Instead, it might be more advantageous for the education program to offer an education theory course that is a prerequisite to enrolling in the exchange program. It is likewise critical

that students learn the value of these pedagogical models in a science context so that they do not dismiss them as models that are only applicable in the arts and humanities.

The importance of exchanges between China and Canada. For Chinese educators who are committed to education reform, the current study aims to pursue a transformative understanding and smooth dialogue between teacher development and school life that can help pre-service teachers facilitate cross-cultural education reform. The study emphasizes the educational, social, cultural, and economic benefits of reciprocity. China is in the early stages of a large-scale education policy initiative, and this narrative inquiry can promote the multi-directional flow of knowledge. As demonstrated by the current research, reciprocal learning can help promote educational reforms in Canada and China and contribute to the well-being of global society and culture. China needs to continue to learn other teaching methods and must promote programs like RLP. Transformative learning will help science pre-service teachers break the barriers of knowledge and influence their future students. The current research demonstrates that the problems encountered by pre-service teacher in Canada and the reflection on Canadian science classes will help future exchange students adapt to exchange life in advance.

Future research. Though the study initially sought to explore participants' reflections on the teaching methods of science education in both countries, the participants had only just completed the second year of teacher education and had limited teaching experience in China. However, some participants had been developing their early teaching careers and saw their experiences in Canada as an opportunity for professional development. To have a true understanding of the value the program has on

teaching practice, it is critical to perform a longitudinal study that follows their development upon their return to China and their experience as teachers. Therefore, future studies should examine pre-service teachers' experiences when teaching in China to determine how the RLP has influenced their teaching careers and professional/pedagogical development.

This research demonstrates the robustness of narrative research, which is a comprehensive and ideal approach to study the cross-cultural experience of Chinese exchange teacher candidates. As Glesson and Tait (2012) note, it is crucial to support the return of teacher candidates to the motherland. Brindley and Holt (2001) observe that any design and implementation of the re-entry reporting process is necessary. While the RLP only provides participants with three months of experience in Canada, during this time, RLP supports various ways to promote their personal and professional development.

There are many possibilities for future research. Clandinin (1997) states that the rhythm experienced by a new teacher entering teaching is different from the rhythm of an experienced teacher. When summarizing the current study's data, several questions arose:

1. How do the RLP's pre-service teachers perform compared to those whose have not participated in an exchange program?
2. What are their colleagues' responses to these new pedagogies?
3. What are their students' responses?
4. What are the parents' responses?
5. Will they leave teaching in the future?
6. How will their international exchange experience promote and support the professional development of pre-service teachers in China?

7. How do these teachers incorporate the knowledge they have learned in Canada into their teaching philosophy?
8. How does this cross-cultural experience help top-down reform of the education system?

These questions may be of interest and warrant further investigation, and teachers who participated in a reciprocal learning program are in a position to provide valuable data about the benefit of exchange programs. Moreover, comparing Chinese transition experiences can provide critical insights for education administrators, academics, and teachers.

The researcher's forthcoming research directions will focus two elements of education: how new educators can understand their students, and how to develop student-centred pedagogies. With regard to student-centred pedagogies, it is critical that teachers adopt a pedagogical model that helps students develop personally and gives them the tools to excel professionally, rather maintaining a pedagogical model whose only function is produce high academic performance. According to Wan, Wong, and Yung (2011), new Chinese science teachers can systematically reflect on their teaching and modify and improve it. They can use student-centred, inquiry-based instruction. In science teaching, flexible and balanced teaching can promote high-level thinking, such as creativity and problem-solving skills. Because of their cross-cultural experience in Canada, their teaching practices should be consistent with the beliefs they hold and form.

Final Thoughts

The cross-cultural learning experiences of the current study's participants is a living book that reveals rich tapestry of human experience that highlights different and

valuable contributions cross-cultural learning can provide pre-service teachers who participant in exchange programs. While rooted in local culture, the Chinese pre-service teachers who participate in the RLP came to see the advantages of Western teaching and can bring the lessons they learned back to China. Although the teaching in mainland China may seem to be content- and teacher-oriented, future Chinese teachers will be able to combine Eastern and Western teaching methods to provide students with the opportunity to participate in inquiry learning. Exchange programs like the RLP will encourage educators to create opportunities by embracing cross-culturalism. The stories shared by Pauline, Zelda, Jenny, and Holly highlight the value of narrative inquiry and the barriers students are likely to face in exchange programs, such as homesickness, isolation, and loneliness, which can all be exacerbated by the failure to integrate. They likewise underscore how struggles with language barriers and time management can impede their learning. Based on their experiences, there are methods and approaches that could help future students overcome these barriers. For example, exchange programs should teach Chinese pre-service teachers about Western pedagogies and transformational learning so that pre-service teachers can engage directly with the teaching styles they observe rather than questioning them without critically engaging with them. For science teacher, these theoretical lessons should include applications in science learning so that pre-service teacher can see how they are applied in their own discipline. They should also learn about Canadian culture and living so that they can maximize their three months of learning by focusing on learning rather than losing valuable time struggling to acclimate to their new culture. The results, though, also highlight the need for future research that explores both how proposed solutions can help

address barriers associated with study-abroad programs. Future research should also explore how pre-service teachers entering the teaching profession apply what they have learned and what barriers they face when introducing Western pedagogies in a Chinese learning context. Regardless of what future studies find, it is clear that exchange programs enrich pre-service teachers' cultural awareness while challenging them to adopt more inclusive, student-centered approaches that improve student outcomes, which is of particular importance in science learning. Thus, study-abroad programs should continue to expand but should also identify the barriers students in the programs face and implement strategies to help them overcome these barriers and enhance their learning process.

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APPENDICES

Appendix A

Reflective Journal Outline

In order to help you better reflect on everything you experience in the international exchange program, you are required to write reflective journals every week during three months. Each journal entry should focus on one main topic which is related to your experience here. The journal should include the following components:

- Reflect on your personal experience with school science teaching and learning
- Make connections to the main topic of the journal entry
- Include both positive and negative observations
- 2-3 pages are long enough for each journal, using double space and 12-point font size.

APPENDICES

Appendix B

Interview Questions

First interview

1. Tell me about your personal background, including your life experience, family situation and education experience.
2. What do you think of China's normal education?
3. What is your comment on Chinese science education? Do you like it? Why or why not?
4. What is the main reason why you joined this program?
5. How do you expect this three-month study tour to affect your future as a teacher?
6. What is your first impression of Canada and Windsor and University of Windsor?
7. What's your first impression of the education faculty?
8. What kind of lessons do you want to take?
9. Before you come here, what do you know about the teaching methods class here?
10. How do you feel about your experience of science education learning in China?
11. What challenges have you encountered here?

Second interview

1. What is your general impression of life in Windsor so far?
2. What's your general impression of education faculty so far?
3. What subjects did you observe at your Windsor school?
4. What do you know about the way of teaching in the classroom in Windsor?
5. Do you have puzzles about the way classes are taught and what is that?
6. What do you know about teacher education here?
7. Do you have any confusion about teacher training here? What do you wonder about?
8. What differences have you observed between Chinese and Canadian science education? Which do you think is better? How will this affect your future development?

Third interview

1. What subjects have you attended?
2. What's your general impression of Windsor schools?
3. What's your general impression of the primary and secondary school students in Windsor?
4. What's your general impression of the teachers in primary and secondary schools in Windsor?
5. What has impressed you most in what you have seen and asked?
6. What are the main differences between primary and secondary education in Canada and China?
7. What are the main differences between science education and science teaching in the

corresponding grades in China? How do you see these differences?

8. How will your experience in Canada affect your future development?
9. What are your overall feelings about joining a pre-employment teacher exchange program? Would you recommend it to future students? Why or why not?

VITA AUCTORIS

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