INVESTIGATING PERCEPTION OF TEACHER'S AUTONOMY SUPPORT ON CREATIVITY OF JUNIOR HIGH SCHOOL STUDENTS: COMPARISON OF URBAN SCHOOLS AND RURAL SCHOOLS FROM SHAANXI PROVINCE OF CHINA

By

RUI-NI WANG

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Researcher	Rui-Ni WANG
Program	Doctor of Philosophy (Education Management)
Principle Supervisor	Dr. Yuan-Cheng CHANG
Co-Supervisor	

Has been approved by

A. Leksan _____ Chairman of the Committee
(Dr. Arisara Leksansern)

Peng-Fei Chen _____ Committee Examiner
(Asst. Prof. Dr. Peng-Fei CHEN)

Jian-Hao HUANG _____ Committee Examiner
(Dr. Jian-Hao HUANG)

Wang, Hsuan-Po _____ Committee Examiner
(Dr. Hsuan-Po WANG)

Yu-Cheng Chang _____ Principal Supervisor
(Asst. Prof. Dr. Yuan-Cheng CHANG)

Approved by the DPU China-ASEAN International College

_____ Dean of China-ASEAN International College
(Assist. Prof. Dr. Chun-Shuo Chen)

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Thesis Title: Investigating Perception of Teacher's Autonomy Support on Creativity of Junior High School Students: Comparison of Urban Schools and Rural Schools from Shaanxi Province of China

Author: Rui-Ni Wang

Thesis Principal Supervisor: Yuan-cheng Chang

Thesis Supervisor: N/A

Program: Ph.D. (Education Management)

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ABSTRACT

This study aims to examine how personality traits and environmental factors affect junior high school students' creativity and to determine if those influences differ between students who attend urban and rural schools. The key variables considered in the investigation are the perceived teacher's autonomy support, students' intrinsic motivation, and cognitive flexibility. The Componential Theory of Creativity, Ecosystem Model of Creativity, and Self-Determination Theory will serve as the foundation for the theoretical framework proposed in this study to illustrate the relationship between students' intrinsic motivation, cognitive flexibility, and perceived teacher's autonomy support on their creativity. A total of 765 Samples of junior high school students in Shaanxi Province, western China, were obtained using a cluster sampling method and the variables that were assessed included students' intrinsic motivation, cognitive flexibility, perceived teacher's autonomy support, and creativity.

The study employed structural equation modelling and multi-group comparative analysis to validate the research hypothesis, and the results showed that：1) Perceived teacher autonomy support, intrinsic motivation, and cognitive flexibility can positively predict junior high school students' creativity; 2) Cognitive flexibility partially mediates the relationship between intrinsic motivation and creativity; 3) Intrinsic motivation partially mediates the relationship between perceived teachers' autonomy support and creativity; 4) Intrinsic motivation and cognitive flexibility seriously mediate the role of perceived teachers' autonomy support on creativity, and 5) In the whole structural equation model, the relationship between perceived teachers' autonomy support and intrinsic motivation differs between urban and rural schools. The impact of perceived teachers' autonomy support on intrinsic motivation is more substantial in schools. These results in this study provided empirical evidence to support self-determination theory and componential theory of creativity and holds important implications for practice of cultivating junior middle school students' creativity.

KEYWORDS: Creativity; Perceived Teachers' Autonomy Support, Intrinsic Motivation, Cognitive Flexibility; Structural Equation Modelling; Mediating Effect.

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CHAPTER 1

INTRODUCTION

1.1 Background of Research

Creativity is the propelling power to fuel the scientific progress and social development (Moran, 2010). The formation of a country's creativity relies on the gathering of talents who have the capacity for innovation. Due to the importance of cultivating creative talents for social development, scholars pay more and more attention to integrate creativity research into the educational practice and to analyse how to cultivate students' creativity (Sawyer, 2006). Paying attention to the cultivation of students' creativity in the classroom can produce numerous advantageous and long-lasting achievements that impel students to become inquisitive and curious adults who have critical thinking and dare to take risks (Csikszentmihalyi, 2013; Hennessy, 2017; Starko, 2018). According to Sternberg (2007), creativity is more crucial now than ever because of the "new and challenging problems we face, whether in our homes, communities, or nations, and we need to think creatively and divergently to address them." In emphasizing the significance of developing creativity and innovation, Robinson (2015) notes that governments and businesses worldwide know that training and education are essential to boosting creativity, given the rapid advancement of science and technology. Adolescence is a crucial time for developing creativity (Rothenberg, 1990). Florida (2002) states that creativity has evolved into one of the fundamental skills needed for youth to succeed in the knowledge economy period.

Therefore, fostering students' creativity in the classroom is one of the essential goals for school education (Albari et al., 2013); Unfortunately, in many countries, elementary education is harshly criticized for impeding the growth of students' creativity. Cho et al. (2017) concluded that the development of students' creativity in K–12 education is threatened and is currently declining at an alarming speed through their study after reviewing a substantial body of literature. More and more professionals are also criticizing China's traditional pedagogical practices for impeding students' creativity, and teachers are being blamed for failing to foster their pupils' creativity. Some academics even contend that the traditional Chinese curriculum stifles pupils' creative potential (Wang & Yang, 2010). In light of this, the Chinese government decided that cultivating students' innovation ability should be the focus of National Educational Reform (Gu, 2010). This illustrates that in the field of educational research and practice in China, concerns about the growth of students' creativity and the reform of the conventional teaching method were growing. The point of the study is to evaluate the degree of creativity of students in junior secondary schools in China and to determine the variables that influence it.

The crucial feature in individuals that influences creativity, according to Amabile's (1988) Componential Theory of Creativity (CTOC), is intrinsic motivation. According to this theory, people are most creative when motivated by the interest, enjoyment, satisfaction, and challenge of the task itself, rather than by rewards, surveillance, competition, or evaluation. According to some researchers (Basadur, 1992; Csikszentmihalyi & Sawyer, 1995; Glynn, 1996), intrinsic motivation is essential for fostering individual creativity. The Self-determination Theory (SDT) focuses on how the social environment can either support or undermine people's intrinsic motivation,

psychological development, and well-being (Deci & Ryan, 2008a; Ryan & Deci, 2002). The SDT asserts that after humans' basic psychological demands for autonomy, competence, and relatedness are fulfilled, they focus on strengthening their sense of self and identity. Specifically, the SDT demonstrates that the fulfilment of psychological needs determines the type of motivation behind an action (Hagger & Chatzisarantis, 2009, 2014; Hagger et al., 2002). Supporters of the SDT believe that individuals' intrinsic motivation can be enhanced by satisfying the need for autonomy. In contrast, Chinese traditional education is founded on teacher-centred, text-based, and exam-orientated instruction, which leads to students' lack of learning autonomy and initiative (Wu, 2017). Therefore, the SDT and CTOC are used in this study to examine the relationship between middle school students' perceptions of autonomy and their innate drive and creativity.

Based on the Eco-systems Model of Creativity (ESMOC) by Yeh (2004), the formation and development of creativity are affected by four sub-systems, namely, the microsystem, mesosystem, ecosystem and macrosystem, the first of which specifically refers to individuals' characteristics, including knowledge, personality traits (attitude, personal tendencies, motivation, cognition), skills and strategies, *etc.*., which form the basic conditions for creativity. While Mumford et al. (2009) confirm the basic role of cognition in developing creativity. Nijstad et al. (2010) describe that Individual performance for creativity is a function of their cognitive flexibility.

The mesosystem consists explicitly of the family and school environment. Yeh (2004) observes that the school environment is a significant factor in the development of youth creativity and that teachers play a crucial role in fostering the adolescents' creativity within that environment. In their qualitative study, Torrance and

Myers (1970) found that it is more conducive for students to express and share their creative ideas when teachers do not evaluate the practice of these ideas and create a class atmosphere that respects and supports their imagination. Ma (2009) found that the more support teachers give to students' novel ideas and encourage them to think from multiple angles, the higher is students' level of creativity. Teachers' autonomous support is perceived as teachers supporting students' autonomous needs (Deci & Ryan, 2000).

The link between the cognitive factors in the microsystem and students' creativity will be explored in this study, along with the association of perceived teacher autonomy support in the medium system and students' creativity, based on the Eco-systems Model of Creativity. Students' perceptions of teachers' support of their demands for autonomy serve as indicators of perceived teachers' autonomy support. Hence, in this article, teachers' autonomous support will be referred to as perceived teacher autonomy support.

In summary, supporters of both the Componential Theory of Creativity and the Eco-systems Model of Creativity believe that individuals' creativity is often affected by external factors (environmental factors) driven by personal features (motivation, cognition). Therefore, the SDT is adopted as the theoretical underpinnings, together with the CTOC and the ESMOC, to build a theoretical model that can demonstrate the influence of intrinsic motivation, cognitive flexibility and perceived teachers' autonomy support on students' creativity. Furthermore, the effect of perceived teacher autonomy support on creativity, as an environmental variable that influences students' creativity via both individual self-factors, namely, intrinsic motivation and cognitive flexibility, is also examined in this paper.

1.2 Statement of Problem

Numerous studies have examined the link between students' creativity and their intrinsic motivation (Lin & Wong, 2014; Liu et al., 2016; Peng et al., 2013; Shalle & Perry-Smith, 2001), as well as the association between their perceptions of their teachers' autonomy support (Dancis, 2018; Guo et al., 2018; Koestner et al., 1984; Reeve & Jang, 2006). In addition, the SDT has been applied to the educational system at the primary school, high school, and collegial and graduate levels (Assor et al., 2002; Black & Deci, 2000; Deci et al., 1981; Grolnick & Ryan, 1987; Hardre & Reeve, 2003; Koestner et al., 1984; Jang, 2008; Jang et al., 2009; Jang et al., 2010; Reeve, 1998; Reeve et al., 2002; Reeve et al., 2004; Vallerand et al., 1997; Vansteenkiste et al., 2004; Williams & Deci, 1996) in the field of international research. However, research to explore junior high school students' creativity using the SDT is still lacking to a great extent. Therefore, more scholars should concentrate on examining the association between self-supporting teachings and adolescents' intrinsic motivation and creativity in the context of junior high schools. Most of the current research of the creativity of students in China is targeted at college students (Huang & Tan, 2018; Li, & Hu, 2016; Meng, 2016; Zheng & Wang, 2018; Zhou & Gang, 2014) or primary school students (Lan et al.,2019; Wang, 2019; Zhang, 2020), while there are insufficient studies of students' creativity using the SDT in junior middle-school settings.

On the other hand, most of China's domestic research of primary and secondary school students' creativity is concentrated in regions that are economically developed (Lockette, 2013), such as Shandong, Beijing, and Shanghai, with relatively

rich results (He et al., 2019; Qi & Hu, 2016b; Ren et al., 2017; Zhao, 2018). However, there is a lack of research of the creativity of middle-school students in the regions of western China that have a regressive economy.

According to Zhao's (2018) research, there are noticeable disparities between pupils from various socioeconomic backgrounds in terms of their creativity. Secondary school students from the economically relatively backward Shannxi province in western China make up the study's samples. The SDT, CTOC, and ESMOC are combined to investigate the link between the students' creativity and intrinsic motivation, cognitive flexibility, and perceived teacher autonomy support.

1.3 Research Objectives

By examining students' intrinsic motivation, cognitive flexibility, perceived teachers' autonomy support, and creativity in secondary schools in China, this study aims to comprehend the effects of three factors on students' creativity and examine the mediating roles of cognitive flexibility between intrinsic motivation and creativity as well as the mediating roles of intrinsic motivation and cognitive flexibility between perceived teachers' autonomy support and creativity. The study requires achieving the ten goals listed below;

1. To search out if there are any noticeable differences between students from different socioeconomic backgrounds in terms of their intrinsic motivation, perceived autonomy support from teachers, cognitive flexibility, and creativity;

2. To assess intrinsic motivation's influence on students' creativity in junior high school.

3. To analyse the impact of intrinsic motivation on students' cognitive

flexibility.

4. To analyse the influence of cognitive flexibility on students' creativity;

5. To examine the mediating function of cognitive flexibility between intrinsic motivation and creativity;

6. To examine the impact of perceived teacher autonomy support on j students' creativity;

7. To examine the relationship between perceived teacher autonomy support and students' intrinsic motivation

8. To examine the mediating function of intrinsic motivation between perceived teacher autonomy support and creativity;

9. To examine the distal mediating role of intrinsic motivation and cognitive flexibility between perceived teacher autonomy support and creativity.

10. To compare the effect of perceived teachers' autonomy support on students' creativity between urban and rural schools in the Shaanxi Province of China.

1.4 Research Questions

1. Are there significant differences in the intrinsic motivation, cognitive flexibility, perceived teachers' autonomy support and creativity of middle-school students from different socio-economic backgrounds?

2. Does intrinsic motivation have a significant influence on middle-school students' creativity based on a self-reported survey?

3. Does intrinsic motivation have a significant influence on middle-school students' cognitive flexibility based on a self-reported survey?

4. Does cognitive flexibility have a significant influence on middle-school

students' creativity?

5. Does cognitive flexibility play a mediating role between intrinsic motivation and creativity?

6. Does perceived teachers' autonomy support have a significant influence on middle-school students' creativity?

7. Does perceived teachers' autonomy support shave a significant influence on middle-school students' intrinsic motivation?

8. Does intrinsic motivation play a mediating role between perceived teachers' autonomy support and creativity?

9. Do intrinsic motivation and cognitive flexibility play a distal mediating role between perceived teachers' autonomy support and creativity?

10. Does perceived teachers' autonomy support play a different role in influencing the creativity of students in urban and rural schools in the Shannxi Province of China?

1.5 Contribution of Study

1.5.1 Theoretical Contribution

The existing research on the creativity of primary and secondary school students in China is mainly focused on economically-developed areas such as Shandong, Beijing and Shanghai (He et al., 2019; Qi & Hu, 2016; Zhang et al., 2015; Zhao, 2018). Zhao (2018) conducted a survey of 120,000 students in basic and secondary schools in the coastal areas of China that are economically developed and found that the creativity of students from rich families was significantly greater than that of students from poor families in these areas. Previous studies of the creativity of

primary and secondary school students in economically backward areas of China are relatively scarce (Lockette, 2013). Therefore, the research participants in this study are students in junior high school in Western China's economically underdeveloped regions. The belief is that an analysis of the effect of students' intrinsic motivation, cognitive flexibility, and their perception of supporting autonomy from teachers on their creativity can provide a new perspective of this phenomenon in economically underdeveloped areas of China to compensate for the lack of creativity research in these areas.

Proponents of the SDT hold that autonomy, relatedness and competence are basic human needs and, when these three basic needs have been met, individuals' intrinsic motivation and self-determination will be stronger, enabling them to achieve their optimal potential. According to supporters of the creativity component theory, individuals' intrinsic motivation, creative personality traits and professional knowledge are the internal factors, and the social environment is the external factor that influence their creativity. Based on the ecological systems model of creativity, the factors that affect creativity can be divided into four levels: microsystem, mesosystem, ecosystem and macrosystem. The microsystem refers to individuals' personal traits, while the mesosystem mainly refers to their surrounding environment. Supporters of both the creativity component theory and ecological systems model of creativity believe that environmental factors influence creativity via individual factors (Amabile, 1988; Yeh, 2004). These three theories are combined in this study to construct a research framework to investigate the effect of students' intrinsic motivation, cognitive flexibility (one of the creative personality traits) as individual factors, and perceived teachers' autonomy support as an environmental factor on creativity. The effect of

perceived teachers' support to students' autonomy on students' creativity via the mediating role of intrinsic motivation and cognitive flexibility is also examined in this study.

1.5.2 Practical Contribution

This study is a reference for the cultivation of students' creativity in economically backward areas of China. Basic education in China is often defined as "examination-orientated" (Dell-Iacovo, 2009), in that it drives students to acquire high scores by memorising information, rather than participating in creative activities (Campbell & Hu, 2010), thereby hindering the cultivation of their creativity. In addition, some researchers believe that the notion of improving students' creativity is contrary to the traditional Chinese culture, which emphasises conformity (Ng, 2001; Niu & Sternberg, 2003; Zhou, 2012). Therefore, exam-orientated education and traditional culture influence people's attitude and behaviour toward the cultivation of creativity, which is obviously different due to different levels of economic development. For example, Shi et al. (2010) undertook a comparative analysis of the influence of primary and secondary school teachers and families in eastern, central and western China on the cultivation of students' creativity, and found that teachers in the western region paid more attention to "taking exams" than their counterparts in the eastern region, and students' homework burden was obviously heavier due to the huge emphasis on admission to a higher-rated school. This emphasis led to teachers ignoring the cultivation of students' creativity.

On the contrary, teachers in the eastern region attached importance to "quality education", which lightened students' homework burden. They regarded examination results and students' comprehensive quality as being of equal importance

and paid more attention to the cultivation of students' creativity. The western region was found to be significantly worse than the eastern region in terms of the parents' educational level, parenting style, economic and material conditions, parent-child relationship and family atmosphere, which was not conducive to the cultivation of children's creativity. These factors eventually led to the creativity of students at primary and secondary schools in western China being significantly lower than that of their eastern counterparts. During their research, Shi et al. (2010) found a significant gap in the attitude toward creativity and the practice of cultivating creativity between the economically-underdeveloped western regions and the economically-developed eastern regions of China. Therefore, students in junior high school from Shaanxi Province in China were taken as research participants in this study. On the one hand, it is expected to guide teachers and parents in Western China to perceive the importance of cultivating students' creativity; on the other hand, some measures to foster students' creativity can be proposed based on the three variables of internal motivation, cognitive flexibility, and perceived teachers' autonomy support and references can be provided for the practice of shaping students' creativity in Western China.

In conclusion, the goal of this study is to investigate how perceived teacher autonomy support affects creativity and how intrinsic motivation and cognitive flexibility play a mediating role in their interaction. The results are likely to show that instructors' autonomy support is crucial in encouraging students' creativity, but they are also likely to show that personal factors should also play a mediating role in how teachers' autonomy support affects students' creativity. The significance of this conclusion to practice is its ability to facilitate a more explicit understanding of the mechanism by which teachers provide autonomous support for students' creativity, and

illustrate the importance of teachers' autonomy support in culturing that creativity. Hence, the paper can provide theoretical support for schools to establish a supportive teaching environment and simultaneously encourage teachers to adopt supportive teaching strategies.

1.6 Ethical Issues

Questionnaires were used to survey grades 7-9 students in junior high school. The survey content included the participants' basic demographics, their parents' occupation and educational background and their family income. It also included the measurement of perceived teacher autonomy support, intrinsic motivation, cognitive flexibility, and creativity. Strict basic ethical requirements were followed and full consideration was given to the participants' rights and privacy during the research process, as detailed below.

Firstly, the consent of the participants' school and its support were requested and obtained. Before starting the investigation, the researcher interviewed and informed the participating school of the purpose and content of the study and the assistance needed from the school, and obtained permission for the students' participation. In addition, an agreement was reached with the partner school to share the research results to provide a reference for the participants' school to cultivate students' creativity.

Second, the participant's right to privacy and to know was completely protected. The researcher explained the study's goals, methodology, participants' roles, and rights before the inquiry began. The student party in this study were told that all information would remain secret, that their teachers would not know the survey findings, and that there would be no effect on their course grades. After obtaining the students'

consent, they were asked to complete the questionnaire survey.

Finally, full consideration was given to the feelings and thoughts of the students. The survey items did not involve content that may affect or harm the psychology of junior middle-school students. It has been established that none of the content of the scales used in this study breaches academic ethics (Jang et al., 2009; Williams & Deci, 1996).

1.7 Scope of Study

The scope in the study is the cultivation of students' creativity. In this study, Junior middle school students recruited in the schools of Shaanxi Province located in West of China are taken as the research objects, and they come from urban and rural areas of Xi'an, Xianyang, Baoji, and Weinan in Shaanxi Province.

The contents of the study include: Firstly, how individual factors such as internal motivation and cognitive flexibility affect middle school students' creativity. Secondly, how do the family socioeconomic status and teachers' autonomy support as environmental factors affect the creativity of students and how teachers' autonomy support affects creativity through intrinsic motivation and cognitive flexibility. Finally, this study compares differences between urban and rural students in the impact of intrinsic motivation, cognitive flexibility, and teachers' autonomy support on creativity. This study adopts quantitative research using the Intrinsic Motivation Inventory, Cognitive Flexibility Inventory, Learning Climate Questionnaire, and Creative scale to measure 765 middle school students and uses the structural equation model to verify all the hypotheses for the above research content.

1.8 Definitions of Terms

The terms used in this study are defined in detail here. This study defines *creativity* as the capacity to generate original and worthwhile concepts, ideas, products, or procedures. *Families' socio-economic* status refers to the hierarchical ranking of valuable social resources (such as education, occupation, family income, etc.) acquired or controlled by the family, which reflects the individual's ability to obtain real or potential resources. *Intrinsic motivation* is a willingness to expend time and energy on a particular activity due to an inner desire or interest and a feeling of being happy and enjoying it. *Cognitive flexibility* was defined as the ability of individuals to flexibly alter their cognition in response to various stimuli or environmental changes. *Teachers' autonomy support* refers to teachers to understand students from students′ perspective during the teaching activities, provide students with information and multiple choices, and minimize control and pressure. Thus, perceived teachers' autonomy support is defined as the perception of students supporting their autonomy from their teachers.

CHAPTER 2

LITERATURE REVIEW

This chapter contains a detailed review of the theoretic basis of the framework of this study, which includes the SDT, the CTOC and the ESMOC, and an analysis of the definition of creativity, intrinsic motivation, cognitive flexibility, and perceived teachers' autonomy support. The relationship between creativity, intrinsic motivation, cognitive flexibility, and perceived teachers' autonomy is also discussed in this chapter.

2.1 Fundamental Theories

2.1.1 Self-Determination Theory

The influence of biology and Darwin's theory of evolution on early motivation theories led to the view that living organisms are a type of machine with motivation as the source of its power (Weiner, 1990). These organisms were attempting to achieve homeostasis, or the optimal state of satiation, and the motivation to act was perceived as being derived from deprivation, which caused a disruption of the homeostatic state (Deci & Ryan, 2000). For instance, a shortage of nutrition stimulates the motivation to search for food and the deprivation of relatedness leads to the motivation to establish relationships with others. These theories contained a common explanation attributed to "drive", which was a concept that aimed to restore an organism to homeostasis.

The self-determination theory (SDT), which is based on early motivation theories in the field of motivational psychology, provides a framework for understanding human motivation. Developed by Deci and Ryan (1985, 1991, 2002) in the late 1970s and early 1980s, this has proved to be one of the most useful approaches to explore many different fields (Deci & Ryan, 2008b; Ryan & Deci, 2011; Su & Reeve, 2011). The SDT consists of six mini-theories and its meta-theory holds that peoples are dynamic organisms that need special environmental nutrition to grow into intact and healthy individuals (Deci & Ryan, 1985, 2000, 2008a; Ryan & Deci, 2000b, 2000a, 2002, 2011). It emphasizes in SDT that the many social environments (such as home and school) people face throughout their lives provide nutrition by which those requirements are either met or unmet. Humans, by nature, need autonomy, competence, and relatedness to reach their full potential. The social context that satisfies a person's fundamental psychological requirements for competence, relatedness, and autonomy creates favourable conditions for that person's growth and development. In contrast, a social environment that cannot supply these demands undermines and impedes personal progress. Theoretically, if these three criteria are met, people's innate drive will be increased (Deci & Ryan, 1987; Ryan & Deci, 2000a).

According to the SDT, the motivation of human behaviour is divided into intrinsic motivation, extrinsic-motivation and amotivation. When individuals are driven by intrinsic motivation, their behaviour relates to their interests, hobbies or experience of fun and pleasure in undertaking a task, whereas the behaviour of those who are driven by extrinsic motivation is related to external rewards, punishment, regulations, pressure *etc.*., and individuals who lack attribution cognition are driven by amotivation and do not know why they behave as they do (Deci & Ryan, 1985, 2002). When individuals

are empowered by intrinsic motivation, they engage in behaviour that makes them feel interesting, satisfied, enjoyable and focused (Deci & Ryan, 1985). Those propelled by intrinsic motivation put all their attention and enthusiasm into the task, so that they can experience the fun and enjoyment of the process.

Intrinsic motivation urges individuals to seek challenges, find new perspectives, expand their capabilities and demonstrate their talent, thereby increasing their self-determination (Deci & Ryan, 2002). On the other hand, those whose behaviour is driven by extrinsic motivation are only concerned with the external results of the task, such as praise and reward, and their devotion and attention to factors other than the task may lead to resentment, conflict and irrelevance in the long run (Deci, 1971). Although extrinsic rewards tend to diminish the intrinsic motivation of reward-related behavior over time, past studies have demonstrated that intrinsic motivation and extrinsic rewards initially have the same motivating effect on behaviour (Amabile et al., 1976; Deci et al., 1999; Plant & Ryan, 1985;). When people lack motivation, they either do not act or act in a negative way. They will pretend to do what they are doing rather than really wanting to do it (Ryan & Deci, 2002); hence, they will not put too much energy or effort into a task. In other words, no motivation refers to an individual's relative lack of motivation to undertake a task. The SDT's proponents also emphasize how satisfying people's fundamental psychological demands for autonomy, competence, and relatedness can increase their intrinsic drive (Deci & Ryan, 1985; Ryan & Deci, 2000a; Ryan et al., 1997).

Deci and Ryan (1985) define autonomy as individuals' belief in self-governance and acceptance of responsibility for their behaviour (Ryan & Deci, 2002). When a task is consistent with one's interests and integrated values and is endorsed by

the self, the behaviour of completing it is autonomous (Ryan & Deci, 2002). Autonomous behaviour is accompanied by persistent willpower (Niemiec & Ryan, 2009; Reeve et al., 2003), which is also considered to be a kind of self-regulation (Reeve et al., 2008; Ryan & Deci, 2006). Individuals' regulation of their behaviour is a reflection of their autonomy, (Reeve et al., 2008), which will facilitate their intrinsic motivation. Heteronomy or controlled regulation is the opposite of autonomy. Heteronomous behaviour lacks self-identity and is regulated by external forces (Ryan & Deci, 2002, 2006). When controlled, individuals' behaviour is associated with a causal relationship of external perception (Decharms, 1968), which easily leads to external motivation.

The capacity to complete a particular activity and the desire of people to express and apply their abilities are defined as competencies by the SDT. According to Ryan and Deci (2002), the desire for competence pushes people to take on challenges that are most appropriate for their ability levels and continually work to retain and improve those abilities through action. Therefore, competency is not a set of abilities or knowledge but rather the efficiency and sense of achievement felt by people when they work to complete a task.

The relationship between perceived competence and motivation is referred to in many motivational theories. There are five theoretical aspects, namely, drive, achievement of goal, control, expectation of value and self-efficacy. These theories contend that perceived competence is one of the critical indicators of motivation, mental health, and performance. People are more inwardly motivated to complete tasks when they believe they can.

Yuan (2017) conducted a study of higher vocational students in Taiwan. He

observed that intrinsic motivation has a positive influence on creativity. Many scholars in the field of academic research have used the SDT to explore the formation and influence of intrinsic motivation (Black & Deci, 2000; Ma, 2009; Whaley, 2012; Chen, 2019; Buff, 2019). The SDT was used in this study to define intrinsic motivation, which means that individuals' behaviour is based on their own interests, hobbies or the experience of pleasure and enjoyment when performing a task. The intrinsic motivation scale of the SDT is used to evaluate the learning motivation of junior high school students. At the same time, the SDT holds that individuals' intrinsic motivation can be enhanced by the fulfilment of their basic psychological needs, namely, autonomy, competence and relatedness. In his empirical research, Ma (2019) also discovered that fulfilling the needs of autonomy, competence and relatedness can enhance individuals' intrinsic motivation. When applying the self-determination theory to this study, teachers' autonomy support is measured by students' perception of the support they receive from their teacher for their autonomy, competence and relationships.

2.1.2 Componential Theory of Creativity

Amabile (1988) extended the research of creativity from individuals to groups and social psychology, and was the first to propose the Componential Theory of Creativity (CTOC) with a summary of within-individual components and without-individual components that affect creativity. He believed that the factors that influence individuals' creativity are intrinsic motivation, domain-relevant skills and creativity-related skills. Amiable (1998) changed domain-related skills in the process of creativity with creativity-related skills and professional knowledge, which mainly includes cognitive style, perceptual style and thinking skills. Therefore, the factors of individuals' creativity so far include professional knowledge, intrinsic motivation, and the related

process of creativity. The external factors refer to individuals' surrounding environment or work environment. Amabile also proposed that nine environmental factors enhance individuals' creativity and nine environmental factors hinder it. The environmental factors that promote the development of individuals' creativity are freedom, excellent project leadership of the project, sufficient resources, encouragement, positive organisational characteristics, identity and feedback, sufficient time, challenging tasks and appropriate pressure, while the nine organisational factors that hinder the development of individuals' creativity in the workplace are negative organisational characteristics, more restrictions, lack of organisational enthusiasm and a poor project leader, improper evaluation, insufficient resources, lack of time, an overemphasis on competition in the organization, which she refers to as work environment factors.

Amabile and Pratt (2016) further revised the CTOC based on the belief that the creativity of individuals or organisations is affected by the working environment and they also expanded the working environment into the general social environment. According to the CTOC, professional knowledge is the basis of creative work and consists of the knowledge and skills to solve a problem or complete a task. Creative personality traits, which include analysing problems based on the use of innovative thinking and new perspectives can transform different ideas, extend thinking, and make unusual associations. Creativity drives individuals to dare to take risks, avoid conformity in work tasks and persevere with untried mechanisms. Intrinsic motivation is the force that compels an individual to engage in a certain task out of interest, curiosity, identity, competition, or challenge. Professional knowledge and a creative personality determine an individual's ability to find new methods to work in a certain field. Intrinsic motivation determines that an individual will persist with using

innovative behaviour to complete a task, no matter how difficult it is, while social contextual factors can influence the background of the task. Therefore, individuals' creativity is not only the result of their individual characteristics, but also the outcome of their interaction with environmental factors (Sternberg & Lubart, 1996; Amabile & Pratt, 2016).

In their research on organizational employee creativity, Li et al. (2018) confirmed that managers' autonomy support influences the workforce's creativity and that intrinsic motivation and cognitive flexibility fully mediate the relationship between them. Paramitha and Indarti (2014) discovered that the support of the work environment and non-work environment could positively predict employees' creativity mediated by intrinsic motivation. Lin & Wong (2014) undertook a survey of hospitality students in Taiwan, and found that intrinsic motivation acts as a mediator between the learning atmosphere in the classroom and students' creativity.

Based on the above research conclusions and the CTOC, junior high school students' creativity can be affected by intrinsic motivation, creative personality traits and environmental factors. Teachers' autonomous support is important as an environmental factor (Sawyer, 2015) and cognitive flexibility is a significant creative personality trait (Wu, & Koutstaal, 2020). As a result, this research examines both the impact of intrinsic motivation on junior high students' creativity and the mediating function of intrinsic motivation and cognitive flexibility between perceived autonomy supported by their teacher and junior high students' creativity.

2.1.3 Ecological Systems Model of Creativity

Yeh (2004) based his Eco-systems Model of Creativity (ESMOC) on his previous research in 1999 and 2000, as well as the Ecological System Model by

Bronfenbrenner (1989), and assorted theories in respect of the convergence of creativity (Csikszentmihalyi, 1990; Sternberg & Lubert, 1996). According to this model, four systems affect the occurrence and development of creativity, as described below.

(A) The microsystem specifically refers to individuals' characteristics, which include knowledge, personality traits (attitude, personality tendency, and motivation), skills, strategies, etc. These are the basic conditions for creativity.

(B) The mesosystem specifically refers to family and school environments. The family environment includes parenting styles, parent and child interaction and family atmosphere, while the school environment includes teachers' behaviour, atmosphere in class and overall school atmosphere. Home and school can affect individuals' potential creativity throughout childhood and even adolescence, but these effects may become less direct as they grow and their importance may decline.

(C) The ecosystem specifically refers to the organisational environment, which can affect employees' creativity. This involves all aspects, including people, things and items, which may have both direct and indirect effects on individuals' creativity.

(D) The macrosystem primarily refers to the social and cultural context of an individual, including the cultural norms, beliefs, and laws that have a significant impact on how they regard and evaluate creativity.

Yeh (2004) emphasises that the ESMOC has two central concepts. Firstly, ecological systems influence individuals' development as they grow up. The development of creativity is a lengthy process that progresses from single to multiple, from easy to difficult, and from independent to interactive. Eventually, as people mature, all four ecological systems merge. Second, all four systems are gradually produced,

impacted, and connected, and each of the four systems affects people's creativity directly and indirectly. Yeh and Li (2011) used the ecosystem model to analyse the effect of age, emotional regulation strategy, temperament and creative drama on preschool children's creativity and found that they had a positive effect. In their study of primary school students, Zhang et al. (2011) found that an environment of autonomous-support can have a positive impact on students' creative thinking by promoting autonomous motivation. Since this finding also confirms the ecological systems model of creativity by Yeh (2004), this research's framework will be based on the main ideas of the ecological systems model of creativity with the aim of illustrating the influence of an autonomy-supportive teaching environment on students' creativity via individual factors.

2.2 Creativity

2.2.1 Definition of Creativity

A review of recent studies on creativity highlights the intense debate among academics over how to define it. The ability to create innovative and valuable goods is what is meant by creativity (Plucker et al., 2004). However, psychologists who have actively explored the concept of creativity have come up with a variety of definitions. According to Silvia et al. (2012), the various definitions of creativity can be grouped into four categories: creative processes, inventive products, individual disparities in creativity, and social psychology of creativity.

The aim of the process orientation of creativity is to understand the psychological representation and process of creative thinking. Runco and Chand (1995) thought that divergent thinking drives the creative process. Later, other

researchers realized that the creative process comprises aggregated and associative thinking (Craft, 2003; Runco, 2007). Creativity's social-psychology orientation focuses on social-context attributes that boost or restrict creativity (Amabile, 1996; Simonton, 2003). Individual differences in creativity mainly focus on the iconic features of particularly inventive talent, such as character, motivation, interests, and mindset (Kim et al., 2010; Runco, 2019). Its focus on products strongly emphasizes assessing and forecasting creativity from a product perspective (Paul & Kaufman, 2014; Walia, 2019; Zhou & George, 2001). According to Sternberg (2007), creativity is the capacity to produce unique and worthwhile concepts, items, or procedures.

The research objects for this study are middle-school students; therefore, they are in the adolescent stage of development, which is characterised by flexible adaptation to a rapidly-changing social environment, in which they progress from being dependent on others to become autonomous individuals (Crone & Dahl, 2012). Since this is a key stage for the formation of creative cognition (Bunge & Wright, 2007; Crone & Dahl, 2012; Diamond et al., 2002; Huizinga & Molen, 2007), middle-school students often demonstrate thoughts and behaviour that are different from those of others. Therefore, product orientation will be used to define creativity in this study by referring creativity to the ability to produce innovative and useful ideas, products or processes.

2.2.2 Measurement of Creativity

The primary methods of measuring the creative process are the divergent thinking test, the convergent thinking test, and the associated thinking test. The most prevalent, the divergent thinking test consists of the three fundamental components of fluency, flexibility, and originality (Guilford, 1950). The Structure of the Intellect (SOI) by Guilford (1967), the Torrance Tests of Creative Thinking (TTCT) by Torrance

(1972), and the creativity assessment battery (rCAB) created by Runco (1991a) are the divergent thinking assessments that are most frequently used in the field of creativity.

The socio-psychological orientation of creativity is mainly the study and analysis of the environmental factors related to creativity in the hope of creating an environment to promote creativity by identifying the factors conducive to it (Amabile et al., 1996; Zhu et al., Chen, 2016). Some scholars believe that certain kinds of environment, such as an autonomous supportive environment, are conducive to the display of individuals' creativity and the measurement of the environmental characteristics that are conducive to creativity can predict creative behaviour (Agnolia et al., 2018; Amabile, 1996). Therefore, researchers use environmental factors conducive to creativity as indicators of a creative environment in order to develop the tools to measure individuals' creativity, such as Assessing the Climate for Creativity (Amabile et al., 1996), the Team Climate Inventory compiled and revised by West & Richter (2007), and the Learning Climate Questionnaire (Williams & Deci, 1996).

The purpose of this study is to explore the effect of the teaching environment on the students' creativity, and based on the results of the socio-psychological orientation of creativity, Koestner et al. (1984) propose that an autonomous-supportive teaching environment is the greatest contributory factor to the development of individuals' creativity. Therefore, teachers' autonomy support is chosen as an environmental variable to investigate its impact on the creativity in this study. The learning climate scale introduced by Williams and Deci (1996) was used to evaluate teachers' support for students' autonomy.

The measurement of students' creativity mainly involves measuring their personal characteristics related to creativity, such as their personality, motivation,

interest and attitude. The corresponding measurement tools are a creative personality assessment, a motivation scale and a creativity tendency scale (Batey & Furnham, 2006; Khatena & Torrance,1976; Williams, 1969), the most dominant of which is the measurement of a creative personality. The original creative personality test was mainly developed to assess the creative personality of highly creative individuals through tests, interviews, autobiographical research and other methods. Later, a new version was compiled by summarising the personality characteristics of highly creative individuals and using it to evaluate the creative personality characteristics of ordinary individuals (Guilford, 1950; Williams, 1969; Eysenck, 1993; Feist, 1998; Batey & Furnham, 2006). The current main creative personality tests are the Creativity Propensity Scale of Williams (1969), the Creative Perception Inventory (CPI) of Khatena and Torrance (1976), and A Creative Personality Scale for the Adjective Check List (Gough, 1979).

However, a review of creative measurement tools indicates that these tools are only suitable for measuring the creativity of adults, but not of junior high school students' because their personality traits are unstable, since they are still in the development stage.

Creative products can generally be divided into two types. One consists of real-life creative achievements and the other consists of creative products that are produced by giving tested products the task of designing or transforming, when the creativity achieved is a collection of novel and valuable products created by individuals in their lifetime (Carson, et al., 2005). This is a commonly-used method for measuring the level of individuals' creativity and the main measurement tools are the Creative Behaviour Inventory (CBI) of Hocevar (1979), the Creative Achievement Scale (CAS) of Ludwig (1992), the Creative Achievement Questionnaire (CAQ) of Carson et al.

(2005), the Biographical Inventory of Creative Behaviour (BICB) devised by Batey (2007), and the Kaufman Domains of Creativity Scale (K-DOCS) of Silvia et al. (2012).

As mentioned above, in addition to K-DOCS, other scales can be used to assess individuals' level of creativity by examining their significant creative achievements or practical behaviour. However, since middle-school students are in the primary stage of learning cultural knowledge, most of them have not yet attained exceptional personal achievements; therefore, these scales are not suitable for evaluating their creativity. K-DOCS is used to evaluate students' level of creativity in five fields, namely, daily life, academic performance (writing and music), science/machinery, the arts, and others, but since its development, it has been mainly used to evaluate college students' creativity. Moreover, it is not suitable for middle-school students due to its distinctive domain particularity, and there is currently no research in which the creativity scale is applied to evaluate middle-school students' creativity. Based on product orientation, creativity is defined in this study as the ability to produce innovative and useful ideas, products or processes. The measurement of creativity of middle-school students emphasises the generality of the field. The creativity scale (Zhou & George, 2001) is used to measure the creativity of the middle-school students in this study, has a self- reporting characteristic whereby the students report the degree of their creative products or ideas themselves.

2.3 Intrinsic Motivation

2.3.1 Definition of Intrinsic Motivation

Woodworth explained the rudiments of the intrinsic motivation theory at the start of the 20th century, when he expressed the belief that curiosity plays a distinctive

role in driving individuals' perceptions and actions, and that initiative and enthusiasm act as internal self-rewards (Woodworth, 1918). Intrinsic motivation has been examined from different perspectives since then and two ways have gradually been formed to interpret it.

One way is to emphasise its composition, which involves linking it to internal needs and spiritual pursuits. For example, in his Hierarchy of Needs Theory, Maslow (1943) described the core of intrinsic motivation as the stimulation of individuals' potential and the attainment of self-actualisation. White (1959) believed that intrinsic motivation is aroused by controlling the process of a task and having a sense of competence, while Deci and Ryan (1985) proposed that the core elements of the formation of intrinsic motivation are the basic psychological needs of autonomy, competence and relatedness. Meanwhile, Amabile interpreted the main elements of intrinsic motivation as being self-determination, competence, integration, curiosity and interest (Amabile, 1993).

The other way of interpretation is to attribute intrinsic motivation to individuals' behaviour based on the behavioural theory. Berlyne (1964) defined intrinsic motivation as an inner desire and the satisfaction of curiosity to drive individuals' behaviour to feel a kind of happiness and enjoy the process, whereas Izard (1977) understood intrinsic motivation as being a process in which individuals focus on tasks and strive to improve their performance, driven by their interest.

Therefore, based on the theory of self-determination combined with the views of the aforementioned scholars, intrinsic motivation (IM) is defined for the purpose of this paper as a willingness to expend time and energy on a certain activity due to an inner desire or interest, and a feeling of being happy and enjoying it. Hence,

intrinsic motivation is derived from the fulfilment of three basic psychological needs: autonomy, competence, and relatedness.

2.3.2 Measurement of Intrinsic Motivation

The Work Preference Inventory (WPI), created by renowned American psychologist Amabile, is one of two methods for gauging intrinsic motivation (Amabile et al., 1994). The measurement of intrinsic motivation takes into account five preferences: (a) self-determination (preference for autonomy and choice); (b) competence (preference for self-control and challenge); (c) integration into the task (degree of concentration and absorption in an activity); (d) curiosity (preference for complex and peculiar things); and (e) interest (enjoying the process and having fun) (Amabile, 1985; Amabile et al., 1994). Richard Ryan, the proponent of the SDT, developed the intrinsic motivation inventory, which is another mainstream scale with an application that is not confined to a particular field of work. This scale can be used to measure the creativity of individuals who take part in any kind of activity because the items on the scale mainly reflect a degree of fun and enjoyment (Ryan, 1982). Besides, there is a more tubular scale, the Situational Motivation Scale (SIMS), which contains four items and emphasises the happiness and fun activities bring to people, and the good feelings people have when they are engaged in them (Guay et al., 2000). However, the aforementioned methods are limited in that individuals describe their level of intrinsic motivation by means of self-reporting, which is highly subjective and easily interfered with by various factors.

The behavioural measurement, which is also known as a free-choice measure, is another common method of measurement that is widely used in experimental research (Cameron & Pierce, 1994). According to the results of a meta-analysis by

Cameron and Pierce, this method is used in more than 64% percent of studies related to the impact of a reward on intrinsic motivation. The free choice method is based on calculating the duration of individuals' willingness to continue to perform an activity when an external incentive is withdrawn. More precisely, the test-giver usually pretends to announce the end of the experiment and leaves the test-takers alone in a certain space for about 8 minutes, during which time they are observed and can continue to work on the task they have been given or are free to read magazines or do other things. The logic of this setting is that, if the subjects continue to work on the experimental task, it indicates that they have intrinsic motivation, and the longer the duration of the work, the greater the intensity of their intrinsic motivation (Deci, 1971). This method is consistent with the connotation of intrinsic motivation, which is deemed to internally drive individuals to do something when there is no external incentive (Deci & Ryan, 1985). However, it is also limited in that the measurement is often taken after the task has ended because it is difficult to measure the change of individuals' intrinsic motivation while they are actually performing the task (Pei, 2018).

Both of the aforementioned methods have their own advantages and drawbacks, which makes the real-time measurement and quantification of intrinsic motivation problematic (Camerer, 2010). Hence, the self-reporting method was chosen to measure the IM of the students in this study due to the operability of the study and the research objects' psychological characteristics.

2.4 Cognitive Flexibility

2.4.1 Definition of Cognitive Flexibility

It is evident from the literature that cognitive flexibility (CF) can be

explained from two perspectives. To begin with, Diamond (2006) believes that cognitive flexibility is the ability to flexibly switch the focus of attention or reaction mapping, while Colzato et *a*l. (2009) regard cognitive flexibility as a specific cognitive ability or skill. Dennis and Vander Wal (2010) further asserted that individuals who can voluntarily change cognition according to distinct stimuli or changing environment can be regarded as having cognitive flexibility. Meanwhile, Garcia-Garcia et al. (2010) observe that cognitive flexibility is the ability to adjust goal-directed behaviour to adapt to changing environmental needs. However, the common theme in all of these descriptions is that someone with CF possesses the attribute of cognitive control (Ionescu, 2012).

Other academics surmise that cognitive flexibility is a quality shared by several cognitive processes (Plunkett, 2006) or a cognitive system (Deák, 2003). Martin and Rubin (1995) propose that it refers to individuals' ability to utilize alternative methods dealing with conflicts in real society. According to the behavioural flexibility feature, some academics have characterized behavioural responses as flexible, such as transporting between multitasking, switching behaviour in response to changing rules, creating new knowledge or equipment, or seeking better solutions to existing challenges (Crone et al., 2006; Goldstone & Landy, 2010; Leber et al., 2008). These definitions of CF address the optional functionalities of cognition (Ionescu, 2012).

Dennis and Wal (2010) believe that the capability to transform cognition patterns to acclimate to the varying environment is a crucial component of the majority of conceptual models of CF. Therefore, their view that individuals freely shift cognition to respond to changing environments was used to define cognitive flexibility in this study.

2.4.2 Measurement of Cognitive Flexibility

One way to evaluate cognitive flexibility is based on individuals' performance using the Stroop Colour and Word Test or Trail Making Test Part B, which are used to evaluate executive function (Golden, 1975; Reitan & Wolfson, 1993). Both methods are used to estimate cognitive flexibility and are commonly based on behavioural response and the degree of sustained response. In other words, a person responds persistently to tasks that demand a shift in perspective in order to react to concrete novel stimuli. This measurement method is challenging to measure accurately for the nature of cognitive flexibility (Dennis & Vander Wal, 2010).

The self-reporting tool used to assess communication-related cognitive flexibility is called the Cognitive Flexibility Scale. According to Dennis and Vander Wal (2010), there is no specific scale that has been created to assess cognitive flexibility based on psychology and is usable by everyone. Based on the findings of their earlier study, they thus created the broader Cognitive Flexibility Inventory (CFIN). The CFIN has 20 items that can be used to assess three different aspects of cognitive flexibility: a) The capacity to see challenging circumstances as modifiable trends; b) The capacity to recognize multiple alternative explanations for life events and human behavior; c) The capacity to come up with multiple alternative Solutions to challenging problems. The content measured by the CFIN is consistent with the definition of cognitive flexibility in this study. Therefore, it is used in the theoretical structure proposed in this study to measure students' flexibility for cognition.

2.5 Perceived Teachers' Autonomy Support

2.5.1 Definition of Perceived Teachers' Autonomy Support

According to Deci and Ryan (1985), autonomy support refers to the recognition of individuals in an authoritative position (for example, teachers) of the feelings of other parties (for example, students) from the latter's perspective and provide the other parties with relevant information and choice opportunities, while trying to reduce pressure and other requirements. In introducing this concept into the educational field, the authors explained that teachers' autonomous support referred to teachers' understanding of their students from the students' perspective in the process of the teaching activities, their provision of information and a variety of choices to students, and their minimisation of the control and pressure on them (Deci, Ryan, 2000). Reeve (2002, 2009) observed that there are two types of teachers' motivational styles in the field of education, namely, self-support style and control style, which can be thought of as the opposite ends of a continuum.

By fostering a person's resources for motivation and acknowledging their potential for autonomous self-regulation, autonomous support offers a way to grow people's intrinsic motivation and internalize external incentive (Reeve & Jang, 2006; Reeve et al., 2008). A growing body of studies have demonstrated that an autonomous support motivational approach, as opposed to a control style, may meet students' fundamental psychological needs for autonomy, relatedness, and competence (Guay et al., 2008; Reeve, 2009) and encourage their inner motivation (Deci et al., 1981). Students' intrinsic motivating resources can be strengthened through autonomy-supportive education, increasing their autonomy. Teachers who have used the self-supporting motivational style are more effective in encouraging their students' behavior,

cognition, and emotional engagement by incorporating their interests into learning activities, offering the right amount of academic rigor, and establishing a secure, respectful, and related learning environment (Whaley, 2012).

The definition of teachers' autonomy support is the basis of related empirical research. Only when the concept of teachers' autonomy support has been clearly defined can it be developed further by clarifying its operational concept. Therefore, Dancis (2018) analysed 15 different methods (9 student reports, 3 teacher reports and 3 Teacher observations) to measure teachers' autonomy support and found a lack of consensus on the basic content or basic elements of teachers' autonomy support. Following additional investigation utilizing these techniques, Dancis identified three elements—respect, choice, and relevance—that enhance teachers' autonomy. Respect was discovered to be a shared element throughout the 15 measuring techniques. This may be characterized as instructors respecting the thoughts, feelings, and views of their pupils and incentivising their active engagement through active listening and power-sharing (Rocchi et al., 2017). One of the three common autonomy support elements that are found in 12 of the 15 autonomy support initiatives was the provision of choice. Giving students alternatives for class and homework means allowsing them to select the subjects and teaching techniques that most interest them. This is how choice is defined in the context of the classroom (Assor et al., 2002). Relevance, the final shared autonomy support element, was covered by 10 of the 15 autonomy support measures. Relevance is described as instructors giving pupils content that has inherent meaning and openly outlining the goals and significance of each task (Reeve, 2006; Wallace et al., 2014).

As also noted in this study, teachers' autonomy support is defined as teachers'

ability to perceive and understand students' feelings, ideas or opinions, and provide them with a variety of choices.

2.5.2 Measurement of Perceived Teachers' Autonomy Support

Ryan and Connell (1989) developed a method to measure autonomy based on the assessment of the degree of individuals' relative autonomy and control (Self-Regulation Questionnaire, SRQ) when they performed certain behaviour (such as homework). The respondents are asked why they engage in a specific behaviour, and the SRQ provides a series of reasons that range from autonomy to control. After the SRQ is completed, a score is given from the so-called Relative Autonomy Index (RAI). In an educational environment, a higher RAI score (that is, more autonomous) predicts the learning input, positive emotions, conceptual learning, teacher's evaluation ability, and ability to cope effectively with the failure of students in basic education (Miserandino, 1996). Other researchers have further pointed out that, compared to control, social situations of autonomy support are associated with better learning concepts and greater creativity (Grolnick & Ryan, 1987).

According to Deci and Ryan (2000), teachers supporting students' autonomy means that teachers can understand students from their perspective during the teaching activities, provide them with information and multiple choices, and minimize control and pressure on them. It is an external environmental factor that affects students' intrinsic motivation. Teachers' autonomy support is currently more commonly measured by the Learning Climate Questionnaire (LCQ), by which students evaluate the degree of autonomy provided by teachers using a self-evaluation method, compiled by Williams and Deci (1996); therefore, teachers' autonomy support can also be called Perceived Teachers' Autonomy Support (PTAS). Black and Deci (2000) used this scale

to analyse students' motivation in learning chemistry and found that teachers' autonomy support improved their motivation. Juan et al. (2015) used a reduced version of the LCQ to analyze the relationship between students' perceived autonomy supported by their teachers and students' autonomy. They used a longitudinal study (one semester) and found that students' perceived autonomy at T1 time can affect the autonomy of students at T2. Chen et al. (2015) also used the LCQ to study perceived autonomy supported by their teachers and students' learning input. Since this scale still has good reliability and validity in the Chinese cultural context, it was used in this study to measure the level of teachers supporting autonomy perceived by the secondary school students.

2.6 Relationship between Creativity and Different Influencing Factors

2.6.1 Effect of Family's Socio-economic Status on Creativity, Intrinsic Motivation, Cognitive Flexibility, and Perceived Teacher Autonomy Support

In the study of children's development, the family's socioeconomic status (SES) is a subject of growing significance. According to several studies, kids from high SES homes get a range of services, resources, parental attention, and social connections that positively affect their development (Brooks-Gunn et al., 1997). According to Entwislea and Astone (1994), social and economic status can be considered a form of capital that the children's families have. They contend that the family has financial capital (material resources), human capital (non-material resources, like education), and social capital (resources derived from social relationships) is helpful for a child's healthy development. Guo & Harris (2000) concur with this viewpoint. Some academics contend that since income is often a better predictor of access to opportunities, it may be used to gauge financial capital (Ostrove et al., 1999; Williams

& Collins, 1990). Both occupation and education are seen as indicators of human capital since they frequently play a role in determining a person's social network. These works of literature illustrate that social capital may be reflected in people's labor position (Rodrigo et al., 2001).

The hierarchical ranking of essential and valuable social resources (such as education, career, household income, Etc.) gained or controlled by the family, as defined by Matthews and Gallo (2011), is referred to as the family's SES and indicates the individual's capacity to acquire actual or potential resources. The indicators of families' socio-economic status may be different in different ethnic and cultural groups (Bradley & Rowe, 1994; Bronfenbrenner, 1995). Stevens et al. (2009) used the mother's educational level as the measure of objective socio-economic status to examine the impact of families' social status on children's selective attention development, whereas Veenstra (2004) chose the family income and father's educational level as the measure of economic status when examining the impact of their socio-economic status on children's health. Hackman et al. (2010) used family income and parents' occupation as the main indicators of their family SES in a study of the relationship between SES and the development of children's brain by considering the different sources of samples. Since the majority of researchers have measured individuals' objective socio-economic status using family income, parents' education and the category of "social class" based on parents' occupation (Bell & Hollingshead, 1975; Duncan et al., 2014), family income and parent's education are also used to measure the family's SES of the junior high school students in this study.

Based on established research, creativity is strongly correlated with and positively influenced by the family's socio-economic condition. For example, an

empirical study of 300 outstanding creative talents by Simon (2011) found that writers and artists tend to come from poor families, while the families of scientists and philosophers are mainly wealthy. When Punia and Niwas (2013) investigated the relationship between the creativity of 300 graduate students and their socio-economic status of their families, they found that the children's creativity level was higher when their parents were graduate students, the family income was higher than average, or their father was a businessman. Parsasirat et al. (2013) also found that the family's economic status and parents' educational level are significantly positively correlated with creativity and that mothers' educational level is more important than fathers' to improve high school students' creativity. Some studies in China have also been focused on the relationship between creativity and the family's socio-economic status. For instance, Shi and Shen (2007) investigated 415 middle-school students' level of creativity and found that the family's socio-economic status was a significant predictor of creativity, and the standardised path coefficients were equal to or higher than those of individual factors, such as intelligence and intrinsic motivation. Furthermore, identified a positive correlation between the development of youth creativity and their families SES.

The socioeconomic status of families has also been linked to a variety of aspects of children's characteristics, according to some researchers. For example, in the literature, a longitudinal study by Gottfried et al. (1998) concluded that the SES of the family directly affected the learning motivation of 8–10-year-old children, and Kusurkar et al. (2011) revealed that the socioeconomic status of the family anticipates children's intrinsic motivation. According to Little's (2017) research, kids from high socioeconomic families had considerably more cognitive flexibility than kids from poor

socioeconomic families. According to Hooker et al. (2018), perceived social support and college students' subjective socioeconomic position have a positive link.

The first hypothesis is put out as follows in light of the literature review that was done above:

H1: Junior school students from families with varied socioeconomic statuses have significantly different degrees of IM, CF, PTAS, and creativity.

H1a: Junior school pupils whose fathers have varied educational levels exhibit substantial disparities in their IM, CF, PTAS, and creativity.

H1b: Junior school pupils whose moms have varied educational levels exhibit substantial disparities in their IM, CF, PTAS, and creativity.

H1c: Junior school pupils from families with various levels of income have significantly varying levels of IM, CF, PTAS, and creativity.

2.6.2 Effect of Intrinsic Motivation on Creativity

From the history of creativity research, we can find that scholars have significant controversy about the definition of creativity. At first, researchers paid more attention to the creativity of outstanding talents and believed that creativity is a unique genetic characteristic of exceptional talents. Gulliford claimed everyone was creative when he was elected American Psychological Association president (Feldman & Benjamin, 2006). Since then, creativity has come to be seen as a psychological trait shared by everyone that can be developed and assessed. Silvia et al. (2012) compiled the definitions of creativity provided by earlier researchers. The four tendencies they identified were: the process of creativity, the individual variations in creativity, the social psychology of creativity, and the result of creativity. According to Pucker et al. (2004), creativity is the capacity for people to develop distinctive, valuable, and original

ideas or goods. Divergent thinking ultimately drives innovation (Runco & Chand,1995). Later research discovered that creativity comprises convergent and associative thinking and divergent thinking (Cropley, 1997; Runco, 2007). Social psychology focuses on the elements of the social environment that nurture or stifle creativity (Dul & Ceylan, 2011; Simon, 2003). The research team's primary focus on individual variations in creativity was on highly creative people's symbolic traits, such as their personality, motivation, interest, and attitude. Sarathy (2018); Prabhu et al. (2008); Kim et al. (2010); The basic foundation for the creative product trend is the assessment and forecasting of creativity from the standpoint of goods (Paul & Kaufman, 2014; Walia, 2019). According to Sternberg (2007), creativity is the capacity to produce unique and worthwhile concepts, items, or procedures.

Intrinsic motivation is described by Berlyne (1964) as an inner desire and the gratification of curiosity that motivates behavior and fosters positive emotions such as happiness and delight. According to Ryan and Deci (2000), intrinsic motivation is a person's willingness to put effort into undertaking a specific activity out of interest. Fundamentally, intrinsic motivation plays a role in attention regulation, which benefits creativity. Motivation stimulates creativity as a cognitive activity. Researchers have shown that intrinsic drive can encourage people to take chances, work hard, and endure in the face of extreme adversity, which can foster creativity (Fredrickson, 1998). A successful or failed creative experience might indirectly impact intrinsic motivation and directly trigger the creative process (Agnoli et al., 2018). The creativity component theory created by Amabile (1988) defines *intrinsic motivation* as one of an individual interior factor to stimulates creativity. According to the investment theory of creativity, intrinsic motivation is one of the six key elements of creativity (Sternberg & Lubart,

1996).

Previous empirical investigations have demonstrated that persons with intrinsic motivation are more likely to produce inventive achievements in various contexts (Bodla & Naeem, 2014; Zhang & Gheibi, 2015). In their study, when individuals are in intrinsic and task-centered motivation, they are more creative (Sternberg& Lubart, 1996). Intrinsic motivation influences an individual's creative performance, according to the study by Runco et al. (1998) to 143 creative researchers. According to a survey of 124 college students conducted by Prabhu et al. (2008) and Gu et al. (2015), who used Chinese college students as research subjects, intrinsic motivation significantly impacts the creativity of college students. Intrinsic motivation helps students' creativity grow, according to research on 215 college students in China. Creative personality and intrinsic motivation are significantly positively correlated in the satudy implemented by Wang et al. (2021). Creativity and intrinsic motivation have a positive link, as Eisenberger and Shanock (2003) were able to demonstrate. According to the present literature, there is little doubt that an individual's inner motivation influences their capacity for creativity, regardless of their cultural background-Western or Eastern. (Grant & Berry, 2011; Prabhu et al., 2008; Zhang & Gheibi, 2015). Thus, the second hypothesis is proposed as follows:

H2: Intrinsic motivation has a significant impact on the junior school students' creativity.

2.6.3 Effect of Intrinsic Motivation on Cognitive Flexibility

A review of the cognitive flexibility (CF) literature reveals that the term has not been given a consistent meaning in earlier research. Others see it as a characteristic of many cognitive processes (Plunkett, 2006) or the cognitive system (Deák, 2003),

while some studies see it as a distinct cognitive aptitude or skill (Colzato et al., 2009). The cognitive flexibility suggested by Dennis and Vander Wal (2010) refers to people's capacity to freely shift their cognition to adapt to various environmental changes. These two points of view are merged in this study. Flexible behavior requires the interplay of a multiple-mechanisms (such as attention shifting, conflict monitoring, and perception) that react to specific environmental demands (Ionescu, 2012).

A significant cognitive component of intrinsic motivation is how people perceive their propensity to act in the environment (Deci, 1971). people perceive their propensity to act in the environment (Deci, 1971). According to academics, intrinsic desire frequently impacts a person's propensity to be flexible (Richmond & McCroskey, 1989). When people are free to pursue their inner interests, they engage in activities organically and spontaneously (Deci, 1975); in other words, intrinsic motivation encourages people to engage in an activity actively. Therefore, a strong intrinsic drive will spark people's willingness to experiment and take on new challenges (Ryan & Deci, 2000b). Positive emotions can be increased by intrinsic motivation, according to Løvoll et al. (2017), and Lyubomirksy et al. (2005) concluded that people who feel good while doing something are likely to make more broad linkages in their current knowledge structure. Therefore, intrinsic motivation may expand cognitive flexibility by encouraging individuals to experience positive emotions. Li et al. **(**2018) contend that individuals driven by intrinsic motivation pay attention to activities that require more flexibility. De Dreu et al. (2011) revealed a favorable association between behavioral activation and cognitive flexibility, and Deci and Ryan (2001) observed that intrinsic motivation was closely linked to student cognitive flexibility. The third hypothesis is put out as follows in light of the literature review that was just completed.

H3: Junior high school pupils' cognitive flexibility benefits from intrinsic motivation.

2.6.4 Effect of Cognitive Flexibility on Creativity

Researchers discovered from her literature reading that CF is typically characterized as a cognitive skill and process and may even be viewed as a cognitive system. Diamond (2006) defined CF as a person's capacity to flexibly change their attention or reaction modes. According to Colzato et al. (2009), CF is a particular cognitive ability. They hold that people who exhibit the freedom to alter their thinking in response to various stimuli or environmental changes have strong cognitive flexibility. Cognitive flexibility is also thought to be demonstrated by the capacity to modify goal-directed behaviours in response to environmental changes (Garcia-Garcia et al., 2010). These researchers all agree that cognitive flexibility is a quality of cognitive control (Ionescu, 2012). Some researchers believe that cognitive flexibility results from various cognitive processes (Martin & Rubin, 1995) or cognitive systems (DeáK, 2003). Martin and Rubin (1995) propose that cognitive flexibility is a feature that individuals show in recognizing their social situation, which enables them to use various alternative solutions to deal with conflicts. Other scholars analyzed cognitive flexibility from the perspective of flexible behaviors (Crone et al., 2006; Goldstone & Landy, 2010; Leber et al., 2008), for example, switching from one task to another, multitasking, changing their behavior according to new rules, finding new solutions to old problems. This perspective of cognitive flexibility reflects cognition's substitutable attribute (Ionescu, 2012). This study measures cognitive flexibility through an instrument involving alternatives and controls both dimensions.

According to the dual pathway to creativity paradigm (De Dreu et al., 2008;

Nijstad et al., 2010), cognitive flexibility and perseverance are critical components of creativity, and dispositional or environmental factors may influence creativity through influencing these two factors. The flexibility route suggests that remote, rather than proximal linkages, broad and inclusive cognitive categories, and flexible shifting between categories, techniques, and patterns can lead to creative insights, problem-solving, or idea generation (Amabile, 1983; Eysenck, 1993). When handling activities, it necessitates that people focus on a variety of tactics and transition fluidly between them rather than only using automatic thought processes and set strategies (Ashby et al., 1999). According to Simonton (1999), removing obstacles between distant ideas and reducing "functional fixedness" are frequently connected with creativity (Smith & Blankenship, 1991). It can be conjectured that cognitive flexibility might is the key factor in creativity. According to Kloo et al. (2010), individual creativity and problem-solving aptitude depend on cognitive flexibility. Researchers are able to assess and confirm the function of cognitive flexibility in creativity through empirical research.

De Dreu (2011) asserted that cognitive flexibility symbolizes the adaptability of thought and behavior and proposes that creativity may be sparked by cognitive flexibility, which is embodied in the cognitive reorganization, association with other things, and destructive process of cognition. Shalley et al. (2004) discovered through their research that people's intrinsic drive increases their positive feeling, cognitive flexibility, risk-taking behavior, and persistence, which all contribute to increased creativity. Intrinsic motivation encourages people to concentrate on their desire to discover new information or acquire new skills. It can foster creativity by boosting their receptivity to novel concepts or experiences (Fredrickson, 1998).

Based on the above analysis of the literature and in line with the first and

second hypotheses, the fourth and fifth hypotheses are proposed as follows:

H4: Cognitive flexibility has a positive predictive effect on students' creativity.

H5: Cognitive flexibility mediate positively the relationship between IM and students' creativity.

2.6.5 Effect of Perceived Teachers' Autonomy Support on Creativity

It has also been highlighted that circumstances that foster autonomy might help with intrinsic motivation. According to Grolnick et al. (1997) and Ryan et al. (1996), the behaviors that encourage autonomy include offering choice, promoting self-initiation, eliminating the use of external controls, and acknowledging the viewpoint and feelings of others. Autonomy-supportive environments (Deci & Ryan1991; Reeve et al., 1999) are those that provide people with opportunities for freedom of expression and action, support them in their decisions, and encourage the development of their identity. These environments help people experience autonomy and, as a result, increase intrinsic motivation (Deci & Ryan,1991; Ryan & Solky, 1996). According to Koestner et al. (1984), an autonomous supportive environment can have a positive effect on students' creativity, and Zhang et al., (2013) confirm that children's creativity can be positively predicted by an autonomous supportive family environment.

The SDT affirms that autonomous support in the classroom can promote students' learning and ultimately lead to greater levels of achievement and development of skills (Deci & Ryan, 1985; Reeve, 2002; Ryan, 1982). Previous researchers have also found that teacher that supports students' autonomy has positively effect on students' creativity (Huang et al., 2018). The following actions show teachers that suppot students' autonomy in the classroom: (1) teachers allow students to choose, and

students can choose the topics or tasks that interest them. In the process of creativity, at the stage of task presentation and preparation, the individual needs to have a strong interest and flexible cognition of the problem to stimulate the desire for creativity (Amabile, 1983); (2) teachers encourage students to ask questions and respect their views, and support them in carrying out activities themselves, which helps to cultivate their independent thinking and ability to break from routine and find better solutions to problems (Shalley & Gilson, 2004); (3) teachers understand students' feelings from their perspective and pay attention to their needs, which is conducive to promoting a good relationship between teachers and students, making students more active in solving problems and facing challenges, and daring to take risks and innovate (Volmer et al., 20112); and (4) Teachers' timely positive feedback and evaluation will increase students' self-efficacy (Shalley & Perry-Smith, 2001), making their thinking more flexible, increasing their willingness to accept challenging tasks, and directly affecting their attitude toward work and their performance (Judge & Bono, 2001). Gu et al. (2015) analysed the relationship between supervisory styles and the creativity of 216 graduate students in China and operationalised supportive supervisory styles, such as personal support, academic support, and autonomy support. Their findings illustrated that a supportive supervisory style has a positive effect on graduate students' creativity. Similarly, the results of other studies in China have also affirmed that the mentor's autonomy support has a positive association with postgraduate students' creativity (Huang & Tan, 2018; Zhu, 2019).

Based on the above analysis of the literature, the sixth hypothesis is proposed as follows：

H6: Perceived teachers' autonomy support has a positive impact on junior

high school students' creativity.

2.6.6 Effect of Perceived Teachers' Autonomy Support on Intrinsic Motivation

A sub-theory of the SDT called the Cognitive Evaluation Theory (CET) focuses on the contextual elements that strengthen intrinsic motivation (Deci, 1975).The CET is focused on individuals' intrinsic motivation and defines it as a kind of universal motivation among human beings and deeply explores the effect of the social context on it. The social context can be described as the environment in which individuals are involved or participate (Deci, Ryan, 1985). These researchers believe that the effect of social environmental factors on intrinsic motivation is achieved through individuals' basic cognitive evaluation of environmental factors. The first is the level of competence individuals feel. When their sense of competence is strong, their intrinsic motivation will increase; otherwise, it will decrease. The second is individuals' sense of autonomy. People must experience that the behaviour is controllable and within the scope of their self-determination, and then their intrinsic motivation is enhanced (Deci & Ryan, 2002). The cognitive evaluation theory divides social environmental factors into autonomy support factors and controlling factors based on the different effects of environmental factors on competence and self-determination. Autonomy support factors refer to those that can provide individuals with positive feedback, help them to gain confidence and competence, enable them to increase their control over activities or events to enhance their intrinsic motivation. Controlling factors refer to individuals' feeling that they are forced or controlled by others to involuntarily carry out activities, or that their behaviour is being strictly regulated. These factors reduce individuals' sense of self-determination and intrinsic

motivation. The strength of individuals' internal motivation will largely depend on an autonomous supportive social environment (Ryan & Deci, 2000b). The prominent influencers are those who manage the educational process and are typically be a leadership role in the social environment (Deci & Ryan, 1985; Jang & Deci, 2010). It is found that students in an autonomy support classroom have more intrinsic motivation than those in a controlled classroom (Deci et al., 1981; Deci et al., 1991), and are more able to internalise the external norms (Grolnick & Ryan, 1989). The results of a study to confirm the effect of high school students' perception of the classroom environment on their use of strategies mediated by the impact on their motivation (Greene et al., 2004) revealed that students who perceive their classroom environment as being autonomy supportive have adaptive motivational beliefs. In another study, Young (2005) found that intrinsic motivation was augmented by much interaction, positive feedback, and specific goals that emphasise learning over grades.

Deci and Ryan (2000) also describe teachers' autonomy support as meaning that teachers can understand students from their perspective during the teaching activities, and provide them with information and multiple choices, thereby minimising control and pressure on them, which is one of the external environmental factors that affect students' intrinsic motivation. When Black and Deci (2000) took college students as samples and used the learning climate scale to test their perception of their teachers' autonomy support, they found that teachers' autonomous support predicts students' intrinsic motivation. A growing volume of empirical literature is devoted to examining the effect of teacher autonomy support on students' intrinsic motivation (Chen et al., 2015; Gu et al., 2015; O'Reilly, 2014; Paramitha & Indarti, 2014). Gillet et al. (2012) studied a sample of 1600 students aged 7-19 years, and found that teacher autonomy

support and students' intrinsic motivation had a positive relationship. Teachers who promote autonomy provide students with choices, allow them freedom to decide how to learn, and give them timely feedback (Reeve & Jang, 2006). Chatzisarantis et al. (2007) found that perceived teacher autonomy indirectly affects intrinsic motivation via attitude. The prior researchers have proved that a supportive teaching environment directly and positively affects students' creativity by enhancing their intrinsic motivation (Chen et al., 2015; Griffin, 2016; Wang & Zhao, 2022).

Based on the above analysis of the literature, the seventh hypothesis is proposed as follows:

H7: Perceived teachers' autonomy support can have a significant impact on junior high school students' intrinsic motivation.

In accordance with hypotheses H2, H3, H4, H5, H6, and H7, the eighth and ninth hypotheses are proposed as follows：

H8: Intrinsic motivation plays a mediating role between perceived teachers' autonomy support and the creativity of students in junior high school.

H9: Intrinsic motivation and cognitive flexibility play a distal mediating role between perceived teachers' autonomy support and the creativity of students in junior high school.

2.7 Gap in the Distribution of China's Compulsory Education Resources between Urban and Rural Areas

Influenced by its typical dual urban-rural structure (Lu & Yang, 2013; Xiao, 2005), China’s educational capital investment, educational infrastructure, and distribution of teachers are imbalanced between urban and rural areas. One of the

manifestations of this imbalance is the concentration of high-quality teaching resources in cities, while rural areas tend to lack educational resources like excellent teachers (Ren Li, 2016). At the primary education stage in China, there is a massive gap between the distribution of teaching resources in the countryside and cities with urban school being provided with more educational resources than their rural counterparts. A great many scholars have discussed the problem of the unbalanced distribution of educational resources between schools in China's countryside and cities (An, 2021; Deng, 2021; Fu & Li, 2020; Gao, 2019). Wen and Gu (2017) analysed the data from China's education statistics yearbook and found that urban schools have more highly qualified teachers, more books, laboratory equipment, digital resources and educational expenditure than rural schools. Teachers' qualifications affect the students' academic performance, while schools' teaching infrastructure is determined by educational expenditure, and the likelihood of students' acquisition of knowledge to improve their performance from outside the class depends on books, laboratory equipment and digital resources. The result of this massive gap in educational resource distribution between countryside and cities is that there are few opportunities for rural students to receive higher education. Statistics show that the proportion of rural students admitted to China's key universities has gradually decreased. In 2010, only 10% of the students of Peking University came from the countryside, and only 17% of those of Tsinghua University came from rural areas (China Education Statistics Yearbook, 2010).

Yu (2020) analysed the factors that influence the quality of compulsory education in China's urban and rural schools and found that urban school students' cognitive and non-cognitive abilities are higher than those of rural school students, and that teachers' professional qualifications can effectively enhance students' cognitive

ability and non-cognitive ability in urban schools. Gao (2019) analysed the data from a China Education Tracking Survey database and found that the academic performance of urban school students is significantly better than that of rural school students. He also found that the academic performance of students declines as the grade increases. In rural areas, the difference between schools is shown by a downward trend, and there is no difference between individual students. In urban areas, there is no difference between schools, but there is a difference between individuals. This indicates that a downward trend in students' performance is more affected by school factors in rural schools. On the contrary, the downward trend in students' performance is more affected by personal factors in urban schools.

Based on the above analysis of the literature, the tenth hypothesis is proposed as follows:

H10: The theoretical model constructed in this study will illustrate the difference between China's urban schools and rural schools.

CHAPTER 3

RESEARCH METHODS

This study aims to assess the correlation between students' perception of autonomy from their teachers' support, intrinsic motivation, and cognitive flexibility and the effects of those variables on creativity. It also investigates the indirect role of perceived teachers' autonomy support on creativity via intrinsic motivation and cognitive flexibility. This study also contrasts different influences of perceived teachers' autonomy support on creativity between urban and rural schools in the stage of China's compulsory education.

This chapter contains the methodology used to complete the research. Therefore, the research framework, research hypotheses, research participants, data collecting process, research instruments and research strategies will all be explained in detail in the next sub-sections.

3.1 Research Framework

According to Amabile (1997), those who seek fun, fascination, the gratification of curiosity, self-expression, or personal challenges at work are motivated by intrinsic factors. Amabile (1997) viewed individuals who seek enjoyment, interest, the satisfaction of curiosity, self-expression, or personal challenges at work as being driven by intrinsic motivation. Many scholars have been eager to analyse the important role of intrinsic motivation in creativity (Basadur, 1992; Csikszentmihalyi & Sawyer, 1995; Eisenberger & Aselage, 2009;

Glynn, 1996; Shin & Zhou, 2003). The creative process includes cognitive styles, perceptual styles, thinking skills and creative self-efficacy (Amabile & Pratt, 2016). Feist (1999), Puccio and Grivas (2009), Raja and Johns (2014), and Raja and Johns (2015) are authors who emphasize the impact of creative personalities (2010). According to Shalley et al. (2004), people's intrinsic motivation boosts their creativity by increasing their willingness to take risks, positive emotion, and be flexible in their thinking and persistence. In the creativity paradigm put forth by De Dreu et al. (2008), cognitive flexibility is one of the two pathways to creativity. Nijstad et al. (2010) showed that cognitive flexibility plays a mediating role between positive activation moods and the originality of creativity, while Liu et al. (2016) believed that intrinsic motivation could produce a kind of "motivational power eager to do", which can arouse individuals' curiosity, interest in the task and ability to experience the fun of it. In other words, intrinsic motivation can arouse individuals' positive emotion to perform a specific task, thereby stimulating their creativity. These findings imply that cognitive flexibility may mediate the relationship between intrinsic motivation and creativity. Li et al. (2018) discovered that cognitive flexibility plays a complete mediating role between intrinsic motivation and creativity. Therefore, based on the creativity component theory and the related evidence from empirical research, it is proposed in this study that: a. Intrinsic motivation has a positive impact on students' creativity and Cognitive flexibility; c. Students' cognitive flexibility positively impacts their creativity, and cognitive flexibility could mediate the role of intrinsic motivation on creativity.

As mentioned above, proponents of the Self-Determination Theory believe that individuals have a basic psychological need for autonomy, competence and relatedness and these needs are universal, internal and essential for well-being (Deci &

Ryan, 2000). With a focus on the consequences of the degree to which the basic psychological needs of individuals are satisfied in different social settings, they determined that social situations that facilitate basic psychological satisfaction would also stimulate intrinsic motivation. Deci and Ryan (2002) further found that intrinsic motivation is enhanced when individuals possess autonomy in social situations. At the same time, based on the Self-Determination Theory, social factors can be divided into control and autonomy support. The latter can provide individuals with positive feedback to enable them to gain self-confidence and competence, and enhance their control of activities or events. Hence, it can increase intrinsic motivation (Deci & Ryan, 1985). Some researchers have confirmed that supporting the demand for autonomy is essential to intrinsic motivation, such as providing choices (Zuckerman et al., 1978) and recognising people's internal experiences (Koestner et al., 1984).

According to the ecosystem model of creativity proposed by Yeh (2004), there are four levels of factors that affect creativity: microsystem, mesosystem, ecosystem and macrosystem. The mesosystem influences individuals' creativity via the microsystem, which mainly refers to individuals' characteristics, including knowledge, personality traits (attitude, personality tendency, motivation), skills, strategies et al. The family and the school environment are the main constituents of the mesosystem. Yeh believed that school is an important social component that affects individuals' creativity, and later researchers found that the main influencers in a social situation are the individuals who possess abundant educational experience and are typically be advantageous positions, such as teachers and parents (Jang et al., 2010). Previous researchers have shown that students' intrinsic motivation is higher when they perceive that they have higher autonomy support from teachers (Black & Deci, 2000; Reeve &

Jang, 2006). Teachers' autonomy support not only enhances students' intrinsic motivation, but also promotes the internalisation of external motivation (Ryan, & Deci, 2000), while having a positive impact on students' creativity (Huang & Tan, 2018; Koestner et al., 1984). It can be determined from the above analysis that teachers' autonomy support enhances students' intrinsic motivation and creativity.

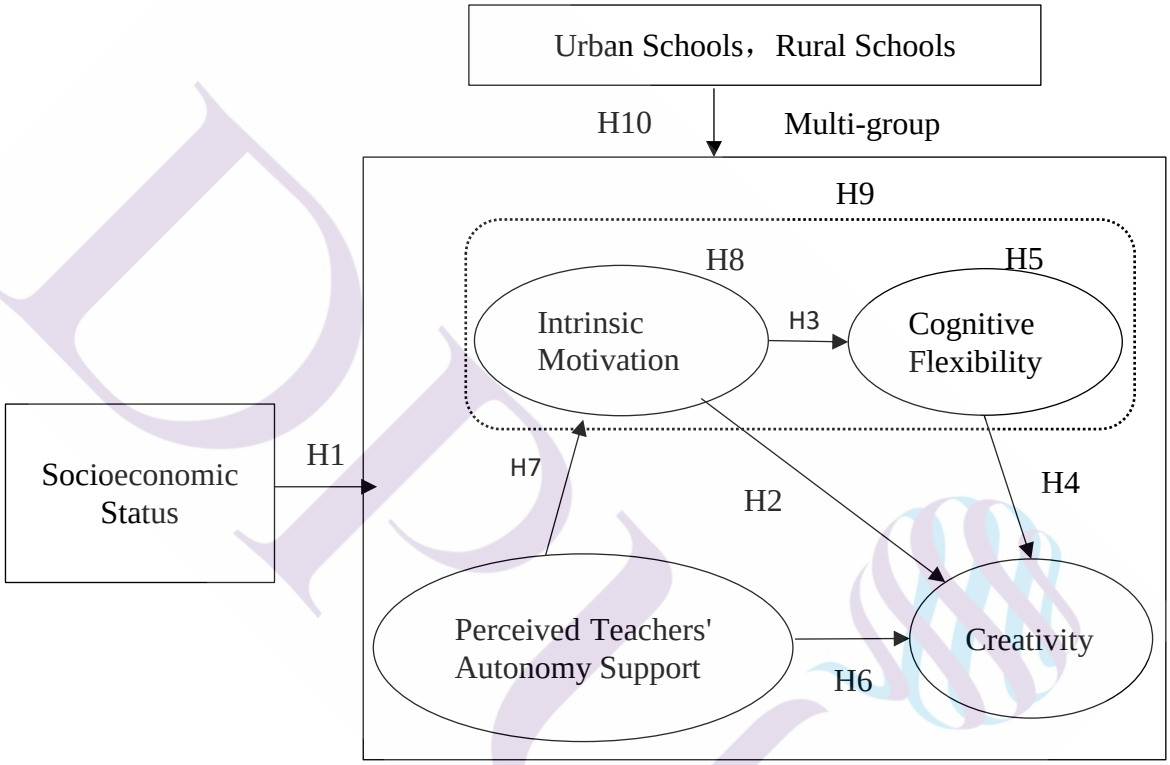

Figure 3.1 Research Framework

Source: Deci & Ryan (1985,1991, 2000); Amabile (1998); Amabile & Pratt (2016); Williams & Deci (1996); Dennis & Vander Wal (2010).

Based on the above theory and evidence from the existing empirical research, and in view of the purpose of this study, Junior middle school students recruited in the schools of Shaanxi Province located in West of China were chosen as the research participants to determine the effect of perceived teachers' autonomy support, junior high

school students' intrinsic motivation and cognitive flexibility on their creativity. Figure 3.1 shows the research framework proposed in this study according to the SDT, CTOC, and ESMOC.

3.2 Research Hypotheses

H1: Junior school students from families with varied socioeconomic statuses have significantly different degrees of IM, CF, PTAS, and creativity.

H1a: Junior school pupils whose fathers have varied educational levels exhibit substantial disparities in their IM, CF, PTAS, and creativity.

H1b: Junior school pupils whose moms have varied educational levels exhibit substantial disparities in their IM, CF, PTAS, and creativity.

H1c: Junior school pupils from families with various levels of income have significantly varying levels of IM, CF, PTAS, and creativity.

H2: Intrinsic motivation has a significant impact on the creativity of junior high school students.

H3: Junior high school pupils' cognitive flexibility benefits from intrinsic motivation.

H4: Cognitive flexibility has a positive predictive effect on students' creativity.

H5: Cognitive flexibility mediate positively the relationship between IM and students' creativity.

H6: Perceived teachers' autonomy support has a positive impact on students' creativity.

H7: Perceived teachers' autonomy support can have a significant impact on

students' IM.

H8: Intrinsic motivation plays a mediating role between PTAS and the creativity of students.

H9: Intrinsic motivation and cognitive flexibility play a distal mediating role between PTAS and the creativity of students.

H10: The theoretical model constructed in this study will illustrate the difference between China's urban schools and rural schools.

3.3 Research Participants

The research participants in this study are 7^{th} -9^{th} grade junior high school students in Shaanxi Province in western China. Shaanxi Province can be found in the geographical centre of China. Its status is that of the easternmost province incorporated in China's Western Development Strategy and it has a lower level of economic development than others in the eastern region. According to the China's National Statistical Yearbook and the Statistical Yearbook of Shaanxi Province, the per-capita GDP of eastern China, such as Beijing, Shanghai, Guangdong, Jiangsu, and Zhejiang provinces, was respectively 140200 yuan, 135000 yuan, 86410 yuan, 115200 yuan, and 98600 yuan in 2018, while the per-capita GDP of Shaanxi Province was 63,500 yuan. In the same year, the per-capita disposable income in eastern China was 36,300 yuan while, in Shaanxi, it was 22500 yuan, among which the disposable income of rural residents in Shaanxi was 11,200 yuan, and the proportion of the rural population in Shaanxi's population was 41.87% percent (China Statistical Yearbook, Shaanxi Statistical Yearbook, 2019). These data indicate that the level of economic development of Shaanxi Province is relatively backward compared to that of eastern China, where

there is a greater gap between the economic development of rural and urban areas.

The reason for choosing junior middle school students recruited in the schools of Shaanxi Privince located in West of China as the research objects for this study is that the existing domestic research on the students' creativity was conducted in the economically-developed areas in eastern China, but there is no equivalent research on the economically-less developed regions in western China. For example, Ren et al. (2017) analysed the influence of parental control on the creativity of primary school students in Shandong Province. Zhao (2018) took a total of 100,000 students in grades 5, 9, and 11 from a seaside city in eastern China as samples to analyse the influence of families' economic status on primary and middle-school students' creativity and found that students from advantaged families had a greater level of creativity than poor students. The family's economic status is one of the factors that affect students' creativity and, since Shaanxi Province has a low level of economic development, taking it as a research object can provide literary support for research on the creativity of primary and secondary school students in areas with a low level of economic development. Another reason is that the existing research on students' creativity is principally targeted at college students (Huang & Tan, 2018; Meng, 2016; Zheng & Wang, 2018; Li, & Hu, 2016; Zhou & Gang, 2014) or primary school students (Lan et al., 2019; Zhang, 2020; Wang, 2019) and there is an insufficiency of studies of students' creativity in junior middle-school settings.

3.4 Research Tools

3.4.1 Basic Information Questionnaire

The basic information of the sample in this study included school, grade,

family location, family type, number of children in the family, parent's educational background, and family income every month. Parents' education and occupation, together with the monthly family income, were used to evaluate the socio-economic status of the samples' families.

3.4.2 Creativity Scale

A 13-item creativity scale with 1 being the least characteristic and 7 being the most characteristic created by Zhou and George (2001) was used to gauge the pupils' creativity. The students are asked to rate how much of each trait they possessed. The questions included statements like "Suggests new approaches to attain goals or objectives," "Comes up with new and practical ideas to boost performance," and "Is not afraid to take chances".

This scale was utilized by Zhang and Bartol (2010) to measure the creativity of Chinese employees, and other researchers have previously used it to measure students' creativity (Tsai et al.,2015; Gu et al., 2015). In earlier studies, Cronbach's alpha ranged from 0.91 to 0.96. This study created a Chinese version of the creativity scale using the back-translation technique (Brislin, 1980), with a pre-test Cronbach's alpha coefficient of 0.957.

3.4.2.1 Analysis of Items of Creativity Scale

Table 3.1 provides an examination of the creativity scale's items analysis. The Critical Ration (CR) was examined initially. The creativity scale's overall score was calculated and was ranked from large to tiny. The cases were split in to high and low groups, with the top 27% placed in the high group and the bottom 27% in the low group. Then, it was determined for each question whether there was a substantial difference between the high and low groups using a single-sample T-test. Table 3.1

shows that there was a statistically significant difference in the CR value of each item. Then, the correlation analysis revealed the correlation coefficient between each item and the overall score.765 to.880, and the revised correlation coefficient ranged from.605 to.856, which were greater than the minimal criterion of .40 or .35 (Wu, 2010). Finally, in identifying homogeneity, the deleted Cronbach 'α value for each item ranged from .958 to .951, indicating high reliability (Bryman and Cramer, 1997). The commonality was between .422 and .786, and the factor load was between .65 and .886, which achieved the minimum standard of commonality .20 (Wu, 2010) and the minimum standard of the factor load .45 (Comrey & Lee, 1992).

3.4.2.2 Reliability Analysis of Creativity Scale

The results of the reliability analysis of the creativity scale are shown in Table 3.2. The corrected item-total correlation ranged from .856 to .605, which met the minimum standard of 0.4 proposed by Wu (2010). Apart from the deleted Cronbach's α (0.958) of item 6 being higher than the Cronbach's α (0.957) of the overall scale, the deleted Cronbach's α coefficient of all the other items was lower than Cronbach's α coefficient of the total questionnaire. Since the Cronbach's α of the overall scale only increased by 0.001 after the deletion of item 6, this item was saved. The above analysis indicates that the reliability of the creativity scale is good.

3.4.2.3 Validity Analysis of Creativity Scale

An exploratory factor analysis was conducted in order to assess the validity of the creativity scale. A principal components analysis was used to extract the factors, and the extraction standard was an eigenvalue greater than 1.0. The varimax method was used for the rotation. The Kaiser-Meyer-Olkin (KMO) value of the creativity scale was 0.947 (Bartlett's =2818.419, p =.000). According to Kaiser (1974), a KMO value

above 0.8 shows that there is a commonality among the variables, and the scale is suitable for a factor analysis. The exploratory factor analysis extracted one factor from the 13 items of the creativity scale, and its eigenvalue was 8.651. The factor loading of each item was above .650, which could explain the 66.543% variation of creativity, as shown in Table 3.3. In conclusion, the results of the exploratory factor analysis confirmed that the creativity scale had good validity.

Table 3. 1 Summary of Analysis of Items on the Creativity Scale

Number of Items	Critical Ration (CR)	Detection of Correlation		Detection of Homogeneity			Number of Substandard Indicators	Note
		Item-Total Correlation	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Communalities	Factor Loading		
Selection Criteria	≧3.0	≧.40	≧.30	<.957	≧.20	≧.45		
C1	14.325***	.822***	.789	952	.679	.824	0	
C2	14.559***	.802***	.766	.952	.645	.803	0	
C3	15.007***	.798***	.756	.953	.630	.794	0	
C4	16.591***	.859***	.832	.951	.740	.860	0	
C5	17.522***	.852***	.821	.951	.732	.855	0	
C6	12.020***	.675***	.605	.957	.422	.650	0	
C7	12.146***	.716***	.668	.955	.504	.710	0	
C8	15.869***	.796***	.757	.953	.631	.794	0	
C9	14.528***	.762***	.717	.954	.582	.763	0	
C10	18.702***	.872***	.847	.950	.773	.879	0	
C11	18.468***	.871***	.856	.950	.775	.881	0	
C12	17.962***	.880***	.821	.950	.786	.886	0	
C13	18.073***	.862***	.841	.951	.751	.867	0	

Notes： *** p<0.001

Table 3.2 Reliability Analysis Summary Table for Creativity Scale

Number of Items	M	SD	Corrected Correlation	Square complex correlation	Cronbach's Alpha if Item Deleted	Cronbach's α
C1	5.12	.999	.789	.699	.952	
C2	5.16	1.012	.766	.635	.952	
C3	4.90	1.139	.756	.717	.953	
C4	5.00	1.035	.832	.777	.951	
C5	5.01	1.088	.821	.725	.951	
C6	4.97	1.287	.605	.452	.958	
C7	5.43	1.002	.668	.497	.955	0.956
C8	5.20	1.042	.757	.663	.953	
C9	5.08	1.071	.717	.575	.954	
C10	5.05	1.033	.847	.786	.950	
C11	5.06	1.011	.856	.794	.950	
C12	5.02	1.027	.821	.810	.950	
C13	5.04	1.068	.841	.773	.951	

Table 3.3 Exploratory Factor Analysis Summary Table for Creativity Scale

Factor	Number of Items	Factor Loading	Eigenvalue	% of Variance	Cumulative % of Variance
Creativity	C1	.824	8.651	66.543	66.543
	C2	.803			
	C3	.794			
	C4	.860			
	C5	.855			
	C6	.650			
	C7	.710			
	C8	.794			
	C9	.763			
	C10	.879			
	C11	.881			
	C12	.886			
	C13	.867			

3.4.2.4 Confirmatory Factor Analysis of Creativity Scale

A Confirmatory Factor Analysis (CFA) framework is used to evaluate the match of the dataset to the measurement construct (Brown, 2015). Before conducting an analysis of the structural equation model, researchers generally use a CFA to test the measurement structure of the scale and the degree to which it matches the dataset and then further analyse the combined reliability and convergence validity of the scale (Anderson & Gerbing, 1988). Goodness-of-fit (GOF) indicators are used during a confirmatory factor analysis to evaluate the model's validity and demonstrate the similarity between the estimated and observed covariance matrices. There are three kinds of fit indices that are often used in structural equation models: Absolute fit indices: Chi-square statistics, the goodness-of-fit index (GFI), the mean square residual (RMM), the standardised root mean residual (SRMR), the root mean square error of approximation (RMSEA), incremental fit indices, the normed fit index (NFI), the comparative fit index (CFI), the Tucker Lewis index (TLI), Parsimony fit indices, the parsimony goodness-of-fit index (PGFI) and the parsimony normed fit index (PNFI). It is evident from the previous literature that most researchers agree to report χ^2, degree of freedom (df), χ^2/df (Chi-square over the degree of freedom), and one or more absolute and incremental adaptation indicators (Hu & Bentler, 1998). In general, researchers accept the criteria of χ^2/df less than 3, GFI, IFI, NFI, CFI, TLI greater than .9, and RMSEA less than.08 (Brown 2015; Byrne 2016; Ghazali et al. 2017; Hair et al. 2018; Loehlin and Beaujean 2017). Hu and Bentler (1998) regarded the CFI, SRMR, RMSEA, GFI, and TLI as ideal indicators. Based on their view, χ^2, df, χ^2/df, the CFI, SRMR, RMSEA, GFI, and the TLI were used as GOF indicators of the model in this study.

The results of the confirmatory factor analysis of the creativity scale are shown in Table 3.5 and Figure 3.2, and the detailed model fit indicators are illustrated in Table 3.4. As can be seen from Table 3.5, χ^2 = 272.171 (p<.001), χ^2/df =4.187. RMSEA=0.065, SRMR=0.03, which is less than the threshold value of 0.08. GFI=.946, TLI=.958, and CFI =.965, which are more than the cut-off criteria of .9 or more. Hair et al. (2018) suggest that researchers could regard their model as a good fit if most of the indicators met the standard. Therefore, according to the above fitness indicators, the creativity measurement model in this study fits well with the dataset. It can be seen from Table 3.4 that the value range of the factor loading of the observation variable was between .64 and .81, which meets the standard of more than .6 suggested by Hair et al. (2010) and had a significance level of .001, while the standardised errors ranged from .208 to .590. The composite reliability (CR) of creativity was calculated, and its value was found to be .939. The threshold of composite reliability is required to be above .6. A composite reliability value of .8 is considered to be very good, and a value above .9 is considered to be excellent (Kline, 2005). The CFA result of creativity in this study shows that it has the best composite reliability. The average variance extracted (AVE) is used to express the degree to which a latent variable can explain the variance of the observed variable. The AVE can be used to evaluate the convergent validity of latent variables. It has been suggested that the value of the AVE should be greater than .5 (Lyngdoh et al., 2018). The latent variable, the AVE of creativity in this study was .544, indicating that the 13 items used to measure creativity possessed good convergence validity.

Table 3.4 Creativity Goodness-of-fit Indicators Table

Model	χ2 value（*p*）	df	χ2/df	RMSEA	SRMR	GFI	TLI	CFI
Creativity	272.171***	65	4.187	.065	.030	.946	.958	.965

Notes: N=765. *** $p<0.001$

Table 3.5 Summary Table of Confirmatory Factor Analysis of Creativity Scale

Variable	Number of Items	Factor Loading	Std Error	Composite Reliability（CR）	AVE
Creativity	C1	.74	.452	.939	.544
	C2	.70	.510		
	C3	.73	.467		
	C4	.89	.208		
	C5	.74	.452		
	C6	.66	.564		
	C7	.68	.538		
	C8	.69	.524		
	C9	.64	.590		
	C10	.80	.360		
	C11	.80	.360		
	C12	.81	.344		
	C13	.78	.392		

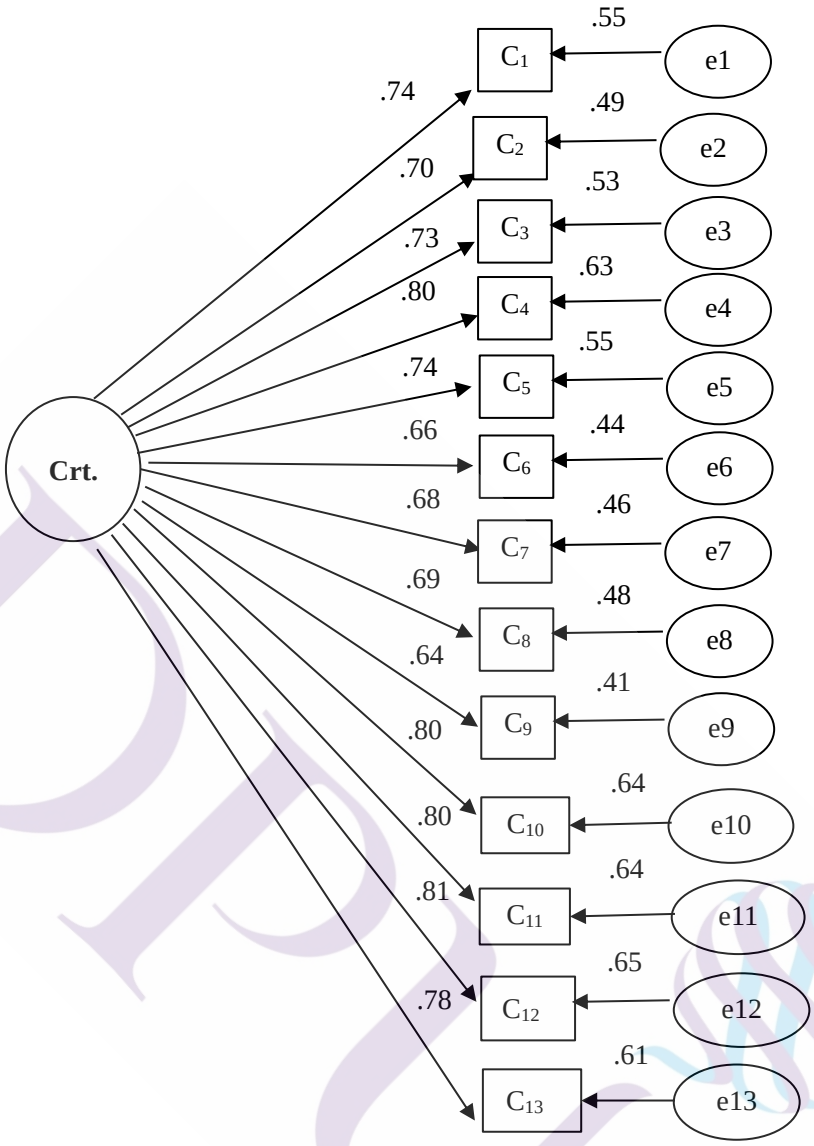

Figure 3.2 Confirmatory factor analysis of Creativity

Note: Crt. for Creativity, and C1-C13 for relevant items.

3.4.3 Intrinsic Motivation Inventory

The Intrinsic Motivation Inventory (IMI) consists of six sub-scale scores measuring an individual's interest, effort, perceived competence, value, pressure, and choice when engaging in a particular activity. The interest subscale can also be used to measure intrinsic motivation (Center for Self-Determination Theory, 2021). Researchers in the past have employed the IMI in several investigations involving self-

control and intrinsic motivation (Deci et al., 1994; Zhou et al., 2009). Berlyne (1964) describes intrinsic motivation as being an inner desire and the satisfaction of curiosity that drives individuals' behaviour, causing them to feel happy, and enjoy this process. For their study, Intrinsic motivation is a desire that encourages a person to be eager to put effort into an activity out of interest (Ryan & Deci, 2000). As a result, the interest subscale of the IMI, which is regarded as a self-reporting measure of intrinsic motivation (Zhou et al., 2009), was used to evaluate the students' intrinsic motivation in this study, and it includes six items. Each item was subjected to a 7-point Likert type scale.

3.4.3.1 Item Analysis of Intrinsic Motivation Inventory

The results of the item analysis of the IMI are shown in Table 3.6. Firstly, it was found from the CR analysis that the CR value of all the items was significant apart from item 7. Secondly, in the correlation between an item and total scores and the correlation between deleted items and total scores, the correlation coefficients of item 7 were -0.001 and -0.010 respectively and less than the minimum standard of .4 and .3 （Wu, 2010). It was then found from the reliability analysis that Cronbach's α of the total scale was .860, but it increased to .921 after item 7 was deleted, and Cronbach's α of the total scale was between .837 and .858 after the deletion of other items. The commonality of all items ranged from .631 to .976, and the factors loading ranged from .794 to .988, both of which reached the minimum commonality requirement of .20 and the minimum factor load requirement of .45 (Wu, 2010). In summary, since 4 points of item 7 in the items analysis did not meet the requirements, item 7 was deleted and only six items were used to test the intrinsic motivation of the junior high school students in this study.

3.4.3.2 Reliability Analysis of the Intrinsic Motivation Inventory

According to the results of the reliability analysis of the IMI shown in Table 3.7, each item of the mean value ranged from 4.89 to 5.0, and the standard deviation was between 1.620 and 1.731. The corrected item-total correlation ranged from .707 to .843, the square complex correlation was between .531 and .765, Cronbach's α was above .80 after deleting item 7, and Cronbach's α of the total scale was .921. These results indicate that the intrinsic motivation scale was more reliable after item 7 was deleted.

3.4.3.3 Validity Analysis of the Intrinsic Motivation Inventory

An exploratory factor analysis was utilised to examine the validity of the IMI. The KMO value of the IMI was .878 (Bartlett's=1043.75, *p*=.000). The results of the exploratory factor analysis that involved the extraction of a factor from the six items of the IMI whose eigenvalue was 4.298 are shown in Table 3.8. The deletion of this factor could explain 71.634 percent of the variation of intrinsic motivation. Each item of the factor loading was above .70. Therefore, the validity of the IMI was found to be good as a measure of junior high school students in China.

Table 3. 6 Summary of Items Analysis of the Intrinsic Motivation Inventory

Number of Items	Critical Ration (CR)	Detection of Correlation		Detection of Homogeneity			Number of Substandard Indicators	Note
		Item-Total Correlation	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Communalities	Factor Loading		
Selection Criteria	≧3.0	≧.40	≧.30	<.860	≧.20	≧.45		
IM1	18.712***	.821***	.730	.853	.693	.825	0	
IM2	16.756***	.815***	.717	.855	.684	.816	0	
IM3	19.169***	.866***	.808	.842	.770	.877	0	
IM4	18.519***	.788***	.696	.858	.631	.794	0	
IM5	19.939***	.853***	.790	.845	.752	.861	0	
IM6	24.007***	.907***	.841	.837	.816	.900	0	
IM7	-.394	-.001	-.010	.921	.976	.988	4	Delete

Notes： *** $p<0.001$

Table 3.7 Reliability Analysis Summary Table for Intrinsic Motivation Inventory

Number of	M	SD	Corrected	Square Complex	Cronbach's Alpha if Item	Cronbach's α
IM1	5.00	1.704	.748	.601	.853	.921
IM2	5.07	1.671	.737	.605	.855	
IM3	4.90	1.731	.812	.682	.842	
IM4	4.99	1.620	.707	.531	.858	
IM5	4.91	1.657	.790	.712	.845	
IM6	4.89	1.703	.843	.765	.837	

Table 3.8 Exploratory Factor Analysis Summary Table for Intrinsic Motivation Inventory

Variable Items	Number of	Factor	Eigenvalue	% of Variance	Cumulative % of Variance
Intrinsic Motivation	IM1	.826	4.298	71.634	71.634
	IM2	.817			
	IM3	.877			
	IM4	.794			
	IM5	.861			
	IM6	.899			

3.4.3.4 Confirmatory Factor Analysis of the Intrinsic Motivation Inventory

A confirmatory factor analysis of intrinsic motivation was implemented in this study to examine the fit between the theoretical model and the research data and the construct validity and combination reliability of the latent variables. The fitness index of the measurement model is shown in Table 3.9, and the results of the confirmatory factor analysis are shown in Table 3.10. It can be seen that the χ^2/df value was 3.065, the RMSEA value was .052, and the SRMR value was .010, which are all lower than the maximum threshold of .08 suggested by scholars. The GFI, TLI, and CFI were all higher than the threshold of .9. These results show that the intrinsic motivation measurement model in this research fits well with the research data. It can be seen from Table 3.10 that the factor loadings of the six observed variables of intrinsic motivation ranged from .771 to .895, and they all attained the significant level of .001. The standardised errors ranged from .199 to .406. The measurement model of the IM is shown in Figure 3.3.

The CR and AVE of the IMI were also calculated here, and it was indicated by the CR value of .947 that this latent variable had the best combination reliability. The AVE value of .749 was more than the required .5 standard, which shows good convergence validity.

Table 3.9 Intrinsic Motivation Goodness-of-fit Indicators Table

Model	χ2 value（p）	df	χ^2/df	RMSEA	SRMR	GFI	TLI	CFI
IM	27.584***	9	3.065	.052	.010	.988	.974	.997

Notes: N=765, the IM for Intrinsic Motivation. *** p<0.001

Table 3.10 Summary Table of Confirmatory Factor Analysis of IMI

Variable	Number of Items	Factor Loading	Std Error	Confirmatory Reliability（CR）	AVE
Intrinsic Motivation	IM1	.864	.254	.947	.749
	IM2	.895	.199		
	IM3	.888	.211		
	IM4	.771	.406		
	IM5	.887	.213		
	IM6	.880	.226		

Notes：The IM for Intrinsic Motivation.

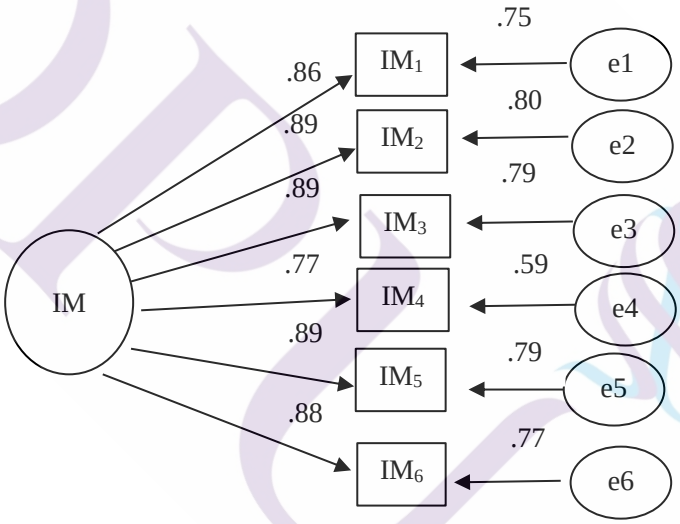

Figure 3.3 Confirmatory factor analysis of the Intrinsic Motivation

Note: IM for Intrinsic Motivation, and IM1-IM6 for relevant items

3.4.4 Cognitive Flexibility Inventory

Cognitive flexibility, which refers to individuals' ability to change their cognition freely in response to different stimuli or environmental changes (Dennis & Vander Wal, 2010), has two attributes of cognitive control and cognitive alternative (Ionescu, 2012). Martin and Rubin (1995), who developed the Cognitive Flexibility

Scale (CFS) to measure Cognitive Flexibility in terms of interaction and communication style. Based on Martin and Rubin's research, Dennis and Vander Wal (2010) compiled the Cognitive Flexibility Inventory (CFIN) in a universal domain and proposed that Cognitive Flexibility has three meanings: a) The capacity to see challenging circumstances as modifiable trends; b) The capacity to recognize multiple alternative explanations for life events and human behaviour; c) The capacity to come up with multiple alternative Solutions to challenging problems. The CFIN is a self-report test of cognitive flexibility that consists of 20 items divided into two subscales: the alternatives subscale (AS), which measures a person's capacity for finding various possibilities for a problem and proposing solutions, and the control subscale (CS), which measures a person's capacity for seeing even the most challenging circumstances as manageable (Dennis & Vander Wal, 2010).

Johnco et al. (2014a) compared the CFIN with the CFS and suggested that the CFIN measured different aspects of cognitive flexibility and had higher internal consistency than the CFS. Multiple previous researchers have applied the CFIN, and there is evidence of its good reliability and validity (Kurginyan & Osavolyuk, 2018; Johnco, et al.,2014b; Wang, et al., 2016). Therefore, the CFIN was used to measure the cognitive flexibility of the junior high school students in this study. The respondents indicated their score of each item based on a 7-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (7). Items 2,4,7,9,11, and 17 were given a reverse score.

3.4.4.1 Item Analysis of Cognitive flexibility Inventory

The results of the item analysis of the CFIN of the junior middle-school students are shown in Table 3.11. It was found that the CR value of all the items was statistically significant ($CR \geq 3.0$, $p = 0.000$), apart from item 2 ($r = .354$, $p = .001$), item

4 (*r* =. 386, *p*=. 001), item 9 (*r* =. 396, *p*=. 001) and item 17 (*r* =. 293, *p*=. 001). The item-total correlation of the other items was above .4. The corrected item-total correlations of the above four items were lower than .35, and that of item 17 was only .190. The Cronbach's Alpha of each item was lower than that of the whole scale (Cronbach's α=.890) of deleted items. The commonality of each item ranged from .362 to .700. and the factor loading of each item ranged from .585 to .820. When considering the results of the item analysis, it was decided to delete item 17 in this study**.**

3.4.4.2 Reliability Analysis of the Cognitive flexibility Inventory

Dennis and Vander Wal used the CFIN to evaluate college students, and it was found to have better internal consistency than the CFS (Dennis & Vander Wal, 2010; Johnco, et al., 2014a). Wang et al. (2016) used the CFIN to evaluate the cognitive flexibility of Chinese college students and the results of the research showed that Cronbach's α of the CFIN, control subscale and alternative subscale were .88, .85, and .83, respectively. In this study, the Cronbach's α of the CFIN, control subscale and alternative subscale were .887, .938 and 0.861, respectively (as shown in Table 3.12). This indicates that the CFIN composed of 19 items still has good internal consistency to test Chinese junior middle-school students.

3.4.4.3 Validity Analysis of the Cognitive flexibility Inventory

Item 15 in the exploratory factor analysis in this study was deleted due to a change from the original control subscales to the alternative subscales. As shown in Table 3.13, after deleting item 15 from the exploratory factor analysis, the KMO of the CFIN was confirmed as .916 (Bartlett's = 2619.838, *p* =. 000), which indicated that it was suitable for the factor analysis (Kaiser, 1974). The two dimensions of alternative and control subscales were extracted from the exploratory factor analysis. The

eigenvalue of the alternative subscale (AS) was 8.063, which could explain 40.2% percent of the variation of cognitive flexibility. The eigenvalue of the control subscale (CS) was 3.749, which could explain 18.90% percent of the variation in cognitive flexibility. The factor loading of each item in cognitive flexibility ranged from .580 to .844. Based on the results of the exploratory factor analysis, the Chinese versions of the cognitive flexibility scale possessed high validity for examining junior high school students in China.

Table 3.11 Summary of Items Analysis of the Cognitive Flexibility Inventory

Number of Items	Critical Ration (CR)	Detection of Correlation		Detection of Homogeneity			Number of Substandard Indicators	Note
		Item-Total Correlation	Corrected Item-	Cronbach's Alpha if Item Deleted	Communalities	Factor Loading		
Selection	≧3.0	≧.40	≧.35	<.890	≧.20	≧.45		
CFIN 1	8.368***	.589***	.528	.866	.492	.699	0	
CFIN 2	4.096***	.354***	.254	.876	.533	.730	2	
CFIN 3	6.839***	.580***	.515	.866	.362	.585	0	
CFIN 4	4.350***	.386***	.290	.875	.641	.801	2	
CFIN 5	8.008***	.598***	.537	.865	.552	.735	0	
CFIN 6	8.801***	.643***	.592	.864	.580	.761	0	
CFIN 7	4.739***	.403***	.302	.875	.656	.810	0	
CFIN 8	9.065***	.724***	.682	.861	.613	.771	0	
CFIN 9	5.298***	.396***	.296	.875	.605	.778	2	
CFIN 10	8.604***	.626***	.569	.864	.489	.698	0	
CFIN 11	5.086***	.415***	.315	.874	.700	.837	0	
CFIN 12	8.974***	.593***	.531	.865	.479	.692	0	
CFIN 13	11.107***	.717***	.676	.862	.672	.820	0	
CFIN 14	9.515***	.662***	.612	.863	.636	.796	0	
CFIN 15	8.702***	.623***	.567	.864	.587	.762	0	

Table 3.11 Continued

Number of Items	Critical Ration (C.R)	Detection of Correlation		Detection of Homogeneity			Number of Substandard Indicators	Note
		Item-Total Correlation	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Communalities	Factor Loading		
Selection Criteria	≧3.0	≧.40	≧.35	<.890	≧.20	≧.45		
CFIN 16	9.454***	.673***	.625	.863	.633	.795	0	
CFIN 17	4.058***	.293***	.190	.879	.573	.750	2	Delete
CFIN 18	10.867***	.693***	.646	.862	.694	.831	0	
CFIN 19	10.555***	.659***	.612	.863	.664	.810	0	
CFIN 20	9.889***	.656***	.604	.863	.659	.807	0	

Notes：*** p<0.001, CFIN for Cognitive Flexibility Inventory.

Table 3.12 Reliability Analysis Summary Table for the Cognitive Flexibility Inventory

Dimensions	Number of Items	M	SD	Corrected Correlation	Square complex correlation	Cronbach's α if Item Deleted	Cronbach's α
Alternative subscales (AS)	CFIN 1	4.87	1.140	.541	.513	.861	0.938
	CFIN 3	5.49	1.187	.519	.382	.861	
	CFIN 5	5.17	1.162	.554	.632	.860	
	CFIN 6	5.31	1.048	.606	.644	.859	
	CFIN 8	5.59	1.049	.693	.579	.856	
	CFIN 10	5.25	1.147	.585	.490	.859	
	CFIN 12	5.60	1.158	.534	.521	.861	
	CFIN 13	5.41	1.013	.691	.669	.856	
	CFIN 14	5.09	1.080	.628	.638	.858	
	CFIN 16	5.38	1.070	.633	.600	.857	
	CFIN 18	5.27	1.082	.663	.684	.856	
	CFIN 19	5.07	1.018	.629	.696	.858	
	CFIN 20	5.21	1.099	.620	.715	.858	
Control subscales (CS)	CFIN 2	4.18	1.422	.271	.416	.875	.861
	CFIN 4	4.16	1.400	.315	.529	.873	
	CFIN 7	4.11	1.479	.326	.538	.874	
	CFIN 9	4.17	1.470	.320	.495	.873	
	CFIN 11	4.17	1.482	.339	.597	.873	

Notes：CFIN for Cognitive Flexibility Inventory, AS for Alternative Subscales, CS for Control Subscales.

Table 3.13 Exploratory Factor Analysis Summary Table for the Cognitive Flexibility Inventory

Dimensions	Number of Items	Factor I Factor Loading	Factor II Factor Loading	Eigenvalue	% of Variance	Cumulative % of Variance
AS	CFIN 1	.702		8.063	40.2	40.2
	CFIN 3	.580				
	CFIN 5	.746				
	CFIN 6	.765				
	CFIN 8	.761				
	CFIN 10	.701				
	CFIN 12	.696				
	CFIN 13	.816				
	CFIN 14	.798				
	CFIN 16	.789				
	CFIN 18	.839				
	CFIN 19	.817				
	CFIN 20	.810				
CS	CFIN 2		.737	3.759	18.907	59.107
	CFIN 4		.800			
	CFIN 7		.817			
	CFIN 9		.796			
	CFIN 11		.844			

Notes：CFIN for Cognitive Flexibility Inventory, AS for Alternative Subscales, CS for Control Subscales.

3.4.4.4 Confirmatory Factor Analysis of Cognitive Flexibility

The CFIN's exploratory factor analysis extracts both control and alternative factors. The CFIN was tested using first-order confirmatory factor analysis in this work. The findings of the standardized parameter estimate of the CFIN are displayed in Figure 3.4, and the confirmatory factor analysis's fitness indicators are reported in Table 3.14. First of all, the model fit indices complied with the norms outlined by several academics (Brown, 2015; Byrne, 2016; Ghazali et al., 2017), indicating that the CFIN's measurement model fits the dataset satisfactorily. Table 3.16 shows that the standardized factor loading range was between.627 and.821, exceeding the criterion above.60 suggested by Hu & Bentler (1999). The factor loadings of all the observed variables had a statistical significance of.001, and the standardized errors varied from .326 to .575. The CFIN's alternative and control factors have CRs of .924 and .885, respectively, demonstrating the CFIN's high dependability. The AS and CS had respective AVEs of.484 and.608. The AVE of the AS was less than the standard value of .5 suggested by Anderson & Gerbing (1988), but following Hair's (1998) focus on the link between sample size and AVE, an AVE above .40 is acceptable when the sample size is more than 350. The results of the AVE supported the CFIN's superior convergence validity. The data gathered by the CFIN thus completely supports that it has more excellent reliability and validity, and the analysis above has demonstrated how well it matches with the theoretical model.

Table 3.14 Cognitive Flexibility Goodness-of-fit Indicators Table

Model	χ2 value（p）	df	χ2/df	RMSEA	SRMR	GFI	TLI	CFI
CFIN	429.549	134	3.206	.054	.035	.941	.951	.957

Notes：N=765, CFIN for Cognitive Flexibility Inventory. *** p<0.001.

Table 3.15 Summary Table of Confirmatory Factor Analysis of Cognitive Flexibility

Dimensions	Number of Items	Factor Loading	Std. Error	Confirmatory Reliability（CR）	AVE
AS	CFIN 1	.652	.575	.924	.484
	CFIN 3	.712	.493		
	CFIN 5	.691	.523		
	CFIN 6	.742	.449		
	CFIN 8	.676	.543		
	CFIN10	.650	.578		
	CFIN12	.635	.597		
	CFIN13	.721	.480		
	CFIN14	.723	.477		
	CFIN 16	.742	.449		
	CFIN 18	.676	.543		
	CFIN 19	.627	.607		
	CFIN 20	.777	.396		
CS	CFIN 2	.776	.398	.885	.608
	CFIN 4	.821	.326		
	CFIN 7	.793	.371		
	CFIN 9	.687	.528		
	CFIN11	.814	.337		

Notes: AS for Alternative Subscales of Cognitive Flexibility, CS for Control Subscales of Cognitive Flexibility.

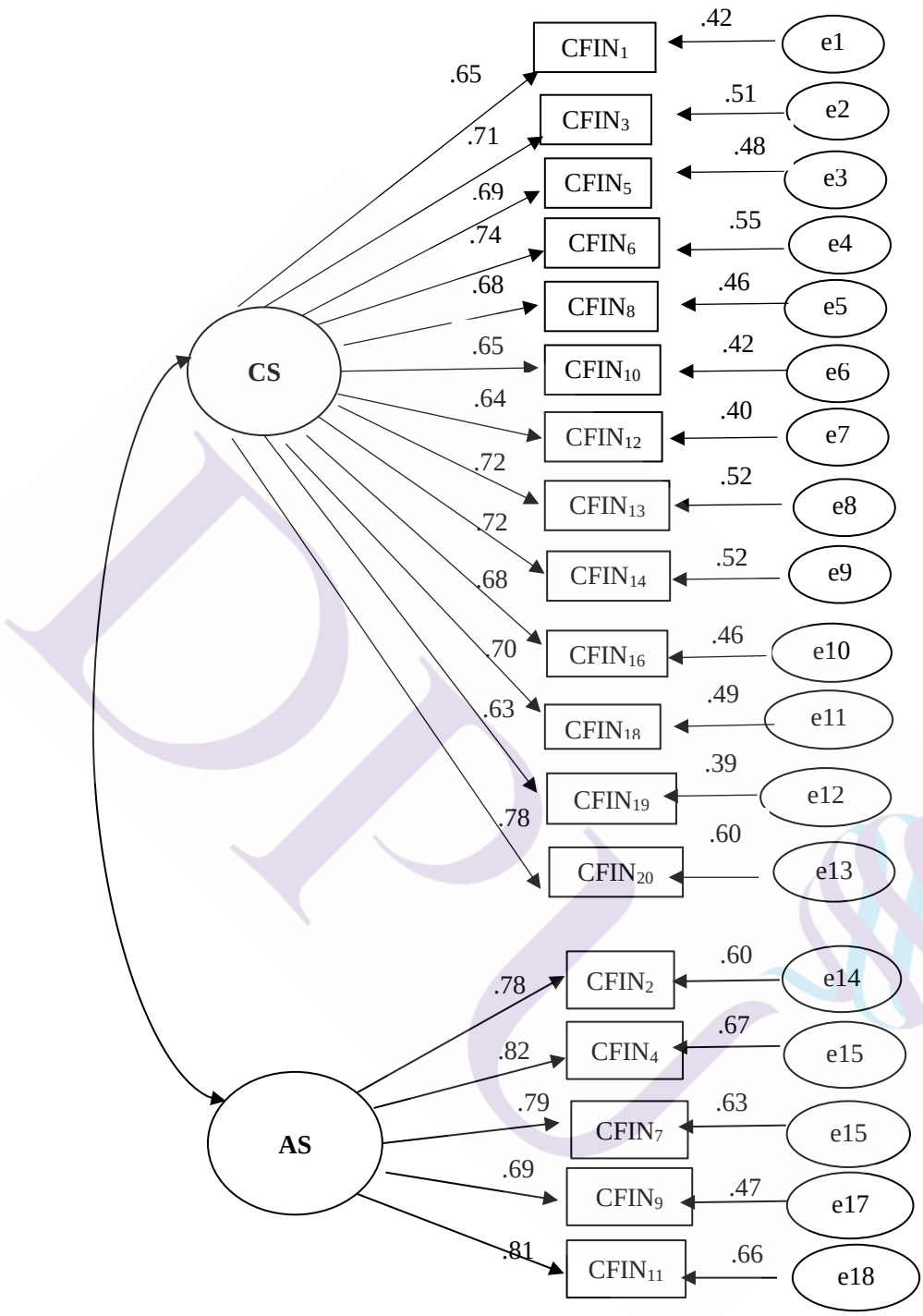

Figure 3.4 Confirmatory factor analysis of the Cognitive Flexibility Inventory

Note: The AS for Alternative Subscales of Cognitive Flexibility, the CS for Control Subscales of Cognitive Flexibility. The CFIN for Cognitive Flexibility Inventory, and $CFIN_1$-$CFIN_{20}$ for relevant items.

3.4.5 Perceived Teachers' Autonomy Support Scale

The Learning Climate Questionnaire (LCQ) developed by Williams and Deci (1996) was used in this study to measure the autonomy support the students received from their teachers. This Questionnaire was based on the self-reporting method, and the students reported their perceived teachers' support for their autonomy. Since Deci & Ryan (2000) considered perceived autonomy to be essential for intrinsic motivation, the LCQ scale was used in this study to measure the effect of the students' perceived degree of autonomy support from teachers, rather than teachers' reported level of support for the students' autonomy on the students' intrinsic motivation and creativity. The scale was composed of three components: choice, respect and importance, and a total of nine questions constituted a single factor. Many researchers have used the LCQ scale to measure students' perception of their teachers' autonomy support and found that it has good reliability and validity (Bean et al., 2020; Black & Deci, 2000; Han et al., 2012; Williams et al.,1997).

3.4.5.1 Items Analysis of Perceived Teachers' Autonomy Support Scale

The results of the items analysis of the perceived teachers' autonomy support scale (PTAS) are shown in Table 3.16. The Critical Ration value of each item was statistically significant ($p < 0.001$). The item-total correlation coefficient ranged from .724 to .815, the corrected item-total correlation coefficient ranged from .634 to .756, and Cronbach's α value if item deleted ranged from .904 to .914, which were lower than Cronbach's α value of .918 in the total table. The commonalities ranged from .501 and .671, and the factors loading were between .708 and .819. Since these analytical results showed that the nine items in the teachers' autonomy support scale met each criterion of the items analysis, all the items were retained.

3.4.5.2 Reliability Analysis of the Perceived Teachers' Autonomy Support Scale

The results of the reliability analysis of PTAS are shown in Table 3.17. Firstly, the averages ranged from 4.36 to 5.22, and the standard deviations ranged from 1.657 to 2.031 for teachers' autonomy support. Secondly, the corrected item-total correlation coefficient ranged from .634 to .756, the square of multiple correlations ranged from .427 to .627, and the Cronbach's α value if item deleted ranged from .904 to .914 which was lower than Cronbach's α .918 of the scale. The results of the internal consistency analysis of the LCQ showed that the Chinese version of the LCQ also had good reliability for junior high school students in China.

3.4.5.3 Validity Analysis of the Perceived Teachers' Autonomy Support Scale

The results of the exploratory factor analysis are shown in Table 3.18, from which it can be seen that the validity of the LCQ was satisfactory. The factors in the principal components analysis with an eigenvalue higher than 1.0, which is the standard for extraction, were extracted and the rotation adopted the varimax method for the exploratory factor analysis. The analytical results showed that the KMO value was 0.935 (Bartlett's=1214.58, *p*=. 000), which indicated that the factor analysis was able to continue. A single factor could explain 60.609 % of the variation of teachers' autonomy support, and the factor loading of each item was between .708 and .819. These results confirmed that the validity of the LCQ was satisfactory.

Table 3.16 Summary of Items Analysis of Perceived Teachers' Autonomy Support

Number of Items	Critical Ration (C.R)	Detection of Correlation Item-Total Correlation	Corrected Item-Total Correlation	Detection of Homogeneity Cronbach's Alpha if Item Deleted	Communalities	Factor Loading	Number of Substandard Indicators	Note
Selection Criteria	□3.0	□.40	□.35	<.918	□.20	□.45		
PTAS1	11.604***	.724	.643	.912	.513	.716	0	Retain
PTAS2	16.361***	.812	.756	.905	.671	.819	0	Retain
PTAS3	15.479***	.787	.724	.907	.628	.792	0	Retain
PTAS4	14.434***	.778	.709	.908	.604	.777	0	Retain
PTAS5	13.052***	.766	.698	.908	.589	.767	0	Retain
PTAS6	14.957***	.815	.756	.904	.665	.815	0	Retain
PTAS7	14.529***	.802	.747	.905	.660	.812	0	Retain
PTAS8	14.266***	.790	.724	.906	.625	.790	0	Retain
PTAS9	13.896***	.725	.634	.914	.501	.708	0	Retain

Notes: *** p<0.001. The PTAS for Perceived Teachers' Autonomy Support.

Table 3.17 Reliability Analysis Summary Table for Perceived Teachers' Autonomy Support

Number of Items	M	SD	Corrected Correlation	Square complex correlation	Cronbach's Alpha if Item Deleted	Cronbach's α
PTAS1	4.88	1.811	.643	.445	.912	
PTAS2	4.77	1.735	.756	.617	.905	
PTAS3	4.95	1.753	.724	.563	.907	
PTAS4	5.15	1.854	.709	.525	.908	
PTAS5	5.05	1.747	.698	.500	.908	0.918
PTAS6	4.78	1.815	.756	.613	.904	
PTAS7	5.06	1.657	.747	.610	.905	
PTAS8	5.22	1.841	.724	.534	.906	
PTAS9	4.36	2.031	.634	.427	.914	

Notes: The PTAS for Perceived Teachers' Autonomy Support.

Table 3.18 Exploratory Factor Analysis Summary Table for Perceived Teachers' Autonomy Support

Factor	Number of Items	Factor Loading	Eigenvalue	% of Variance	Cumulative % of Variance
PTAS	PTAS1	.716	5.455	60.609	60.609
	PTAS2	.819			
	PTAS3	.792			
	PTAS4	.777			
	PTAS5	.767			
	PTAS6	.815			
	PTAS7	.812			
	PTAS8	.790			
	PTAS9	.708			

Notes: The PTAS for Perceived Teachers' Autonomy Support.

3.4.5.4 Confirmatory Factor Analysis of Perceived Teachers' Autonomy Support

The results of the confirmatory factor analysis of perceived teachers' autonomy support verified that the model to measure this potential variable was well-matched with the dataset. As shown in Table 3.19, the RMSEA value of .07 and SRMR value of .021 were less than the cut-off criteria recommended by McDonald and Ho (2002). The GFI, TLI, and CFI were more than the threshold value of .90. Worryingly, the value of χ^2 / df was 4.77, which exceeds the most commonly-used standard of less than 3. However, based on previous literature, a value of χ^2/df between 3 to 5 is acceptable when other fitting indices meet the requirements (Othman, 2016). Therefore, the results of the analysis illustrate that the perceived teachers' autonomy support measurement model fits well with the observed data and reflects the actual situation.

Table 3.19 Perceived Teachers' Autonomy Support Goodness-of-fit Indicators Table

Model	χ^2 value（p）	df	χ^2/df	RMSEA	SRMR	GFI	TLI	CFI
PTAS	128.208***	27	4.77	.07	.021	.965	.974	.980

Notes: The PTAS for Perceived Teachers' Autonomy Support. *** p<0.001.

The factor loading of each observation variable, the standardised residual, the CR and the AVE of the structure were evaluated in this study and the results can be seen in Table 3.20. The factors loading ranged from .697 to .840 (higher than the standard of .60) and reached a statistical significance of .001, and the standardised residual of each observation variable was between .295 and .517. The analytical results indicated that the construction validity of the theoretical model was good. The CR shown in Table 3.20 reached the best standard above .90 (Kline, 1995), proving that the latent variable had the best CR. The AVE value of .651 exceeded the threshold value

of .50, indicating that the observed variable effectively reflected the potential variable, representing and supporting the convergent validity of the latent variable (Anderson & Gerbing, 1988).

Table 3.20 Summary Table of CFA of Perceived Teachers' Autonomy Support

Variable	Number of Items	Factor Load	Std.2 Error	Confirmatory Reliability（CR）	AVE
PTAS	TAS1	.786	.382	.944	.651
	TAS2	.823	.323		
	TAS3	.840	.294		
	TAS4	.801	.358		
	TAS5	.825	.319		
	TAS6	.830	.311		
	TAS7	.820	.328		
	TAS8	.832	.308		
	TAS9	.695	.517		

Notes: The PTAS for Perceived Teachers' Autonomy Support.

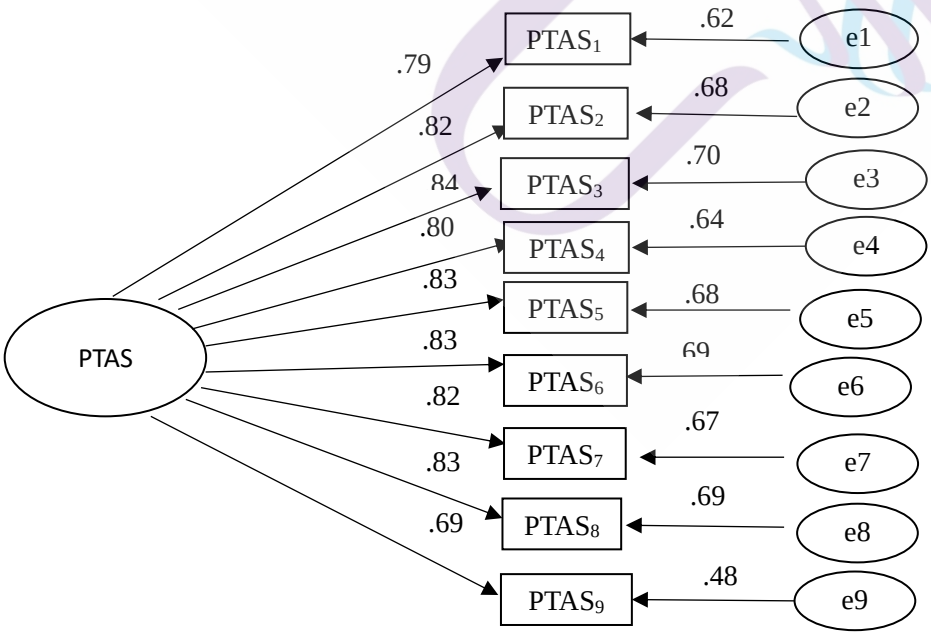

Figure 3.5 Confirmatory factor analysis of Perceived Teachers' Autonomy Support

Note: The PTAS for Perceived Teachers' Autonomy Support, and PTAS1-PTAS9 for relevant items

3.5 Data Collection

3.5.1 Pilot Data Collection

Pilot data was collected in order to verify the reliability and validity of the scale used in this study. Chaoyang Road and Duqiao junior middle-schools in Weinan City of Shaanxi Province were selected for investigation at this stage. The data was collected online via the Questionnaire Star due to COVID-19. After uploading the questionnaire to the network platform, a video was recorded to illustrate the content and purpose of the survey and the students' voluntary participation. The questionnaire links and videos were sent to the QQ group of the class simultaneously by the six headmasters of the two junior middle-schools, and the students were requested to voluntarily participate in the questionnaire survey after watching the video content. A total of 267 questionnaires were collected, out of which 241 were valid, with an effective rate of 90%.

3.5.2 Determination of Sample Size

According to the statistical yearbook of Shaanxi Province, there were 1807400 junior middle-school students in Shaanxi Province in 2019 (Shaanxi Statistical Yearbook, 2020). According to the calculation formula of the minimum sample size,

$n \geq \frac{N}{(\frac{\alpha}{Z})^2 \frac{N-1}{P(1-P)}+1}$ (N = 1807400, Z=1.96, α= 0.05, P = 0.5), and the sample size is about 385. Schreiber et al. (2006) recommended that the minimum sample size in CFA should be more than ten times the estimated parameters. In this study, the CFA of

cognitive flexibility consisted of 38 parameters that needed to be estimated. Compared to other variables, a confirmatory factor analysis of cognitive flexibility is needed to estimate the most parameters. According to the above rules, the minimum sample size of the current study should be 370. In fact, the total sample size (n = 765) was more than 20 times the estimated parameters in the CFA of cognitive flexibility. Because the covariance in the SEM is quite sensitive to sample size, Hair et al. (2006) recommended that researchers choose the sample size by considering the complexity and characteristics of the model. According to Hair and colleagues (2006), an SEM model needs more than 200 samples if it has five or fewer components. Therefore, this study's sample size of 765 satisfies the criteria for five structures based on the abovementioned suggestion.

3.5.3 Formal Data Collection

In order to make the collected data more representative, four junior high schools from Xi'an, Weinan, Xianyang, and Baoji city in Shaanxi Province were chosen for the investigation and cluster sampling was used to examine 24 classes as a sample of different grades of each school. Specifically, two classes are selected from each grade in each school. When extracting classes, a simple random sampling method was used.

Four institutions make up the sample: Schools A and B are situated in rural Baoji and Xianyang, respectively, while schools C and D are situated in Weinan and Xi'an, respectively, in metropolitan areas. The data for this study were obtained online. After sampling the sample, the teaching supervisor of each school provided the QQ group of students with the link to the questionnaire. The researcher guided the students to fill in the questionnaire and asked them to submit it after answering all the questions. There is no missing value as a result of the retrieved data. The formal survey yielded a

total of 846 questionnaires. A total of 765 valid samples were collected after removing the diagnostic data distribution's extreme value, kurtosis, and skewness. 187 samples are from Baoji, 197 from Xianyang, 165 from Weinan and 216 from Xi'an.

3.5.4 Distribution of the Study Sample

The demographic information of a total of 765 valid participants are shown in Table 3.21. 392 participants are males and 373 ones are females in the samples. There are 199 respondents in the seventh grades, 351 respondents in eighth grades and 215 respondents in ninth grades accounting for 26.0%, 45.9%, and 28.1% of the overall samples. Among them, 110 participants in seventh grade came from rural schools and 89 from urban schools. The number of participants from rural and urban schools in eighth grade was 143 and 208, respectively. A total of 131 participants in ninth grade came from rural schools, and 84 came from urban schools. The participants were between 11 and 17 years old. The families of 351 students lived in rural areas, and those of the remaining 414 students lived in cities. 37.6% of the total 765 samples were from one-child families, 54.8% were from families with two children, and 7.6% were from families with more than two children.

Table 3.21 Distribution of Demographic Variables of Sample n=765

Background variable	Category	Number	Percentage	Cumulative percentage
Gender	Male	392	51.2	51.2
	Female	373	48.8	100
Grade	Seven	199	26.0	26.0
	Eight	351	45.9	71.9
	Nine	215	28.1	100

Table 3.21 Continued

Background variable	Category	Number	Percentage	Cumulative percentage
Ages	11	16	2.1	2.1
	12	72	9.4	11.5
	13	260	34.0	45.5
	14	301	39.3	84.8
	15	100	13.1	97.9
	16	11	1.4	99.3
	17	5	0.7	100
School	A	187	24.4	24.4
	B	197	25.8	50.2
	C	165	21.6	71.8
	D	216	28.2	100
Region	Countryside	351	45.9	45.9
	City	414	54.1	100
Total of the family's children	One	288	37.6	37.6
	Two	419	54.8	92.4
	More than two	58	7.6	100

3.6 Data Analysis Strategy

SPSS 24.0 and AMOS 24.0 were used to analyse the data collected for the whole study, including the pilot data.

3.6.1 Pre-investigation Stage

An items analysis, exploratory factor analysis and reliability analysis were used to check the reliability and validity of each scale of the pilot data. The purpose of the items analysis was to test the discrimination and reliability of each item of the Chinese version after the back-translation procedure. Specific methods included high

and low group T-test, an item related to the total score, reliability test, commonality and factor loading. The exploratory factor analysis was used to test the validity and reliability of the scale's analysis to test the scale's internal consistency.

3.6.2 Formal Investigation Stage

3.6.2.1Confirmatory Factor Analysis

AMOS 24.0 software was used to analyse the data by performing a confirmatory factor analysis in order to check the fit of the dataset with the measurement model and the convergent validity, discriminant validity, and composite reliability of each scale.

3.6.2.2 Test of Common Method Bias

A confirmatory factor analysis was used to test for possible common method bias. The specific process involves checking whether there is a problem of a common method bias by comparing whether the chi-square increment of the single-factor structure and the five-factor structure have reached a statistically significant level. If the test result is significant, the five-factor model is better, and there is no obvious common method bias problem in this study.

3.6.2.3 Descriptive Statistics and Correlation Analysis

Descriptive statistics were used to analyse the sample's demographic information and various research variables. The correlation between the four variables of intrinsic motivation, cognitive flexibility, perceived teacher autonomy, and creativity laid the foundation for the subsequent verification of the model.

3.6.2.4 Variance Analysis

In order to ascertain if students from diverse socioeconomic backgrounds differed in creativity, intrinsic motivation, cognitive flexibility, and perceived teacher

autonomy support, variance analysis was performed in this study. The parents' or mothers' educational backgrounds and the students' household income determined the students' socioeconomic position. The analysis of variance was used to examine whether there were any differences in the students' intrinsic motivation, cognitive flexibility, perceived teacher autonomy, and creativity. The factors included the family's monthly income and parents' educational background.

3.6.2.5 Structural Equation Modelling Analysis

AMOS 24.0 software was used to verify the structural equation model in this study in order to examine the influence of PTAS, IM, and CF on students' creativity, as well as the mediating role of CF between IM and creativity and the mediating role of IM and CF between PTAS and creativity.

3.6.2.6 Multiple Group Comparative Analysis

Finally, a multi-group structure equation model was used to contrast the previously validated hypothetical model that compared urban and rural schools. The aim of a multi-group analysis is to ascertain if the corresponding parameter estimation of a path model diagram suitable for a particular group is also suitable for other groups (Wu,2010). Two types of schools located in urban and rural areas of China were compared in this study with the aim of determining if there was a distinctive difference in the path coefficients of the hypothesis model verified by the previous analysis.

CHAPTER 4

RESULTS

In this chapter, the researcher describes the verification process of 10 research hypotheses in detail. The study first conducted descriptive and correlation analyses and evaluated the common method variance. For the study of 10 hypotheses, the first step was a multivariate analysis of variance to analyze the differences in creativity, IM, CF, and PTSA among students with different families' SES. In the second step, this study tested the influence of individual factors on students' creativity, involving the influence of IM and CF on creativity. The third step was to integrate individual and environmental factors into the model simultaneously and to analyze the effect of IM and PTAS on students' creativity. Next, this study examined how PTAS as an environmental factor affected students' creativity through two individual factors: IM and CF. In the last step, a multi-group comparative analysis was used to examine the differences in the effects of three variables on creativity between urban schools and rural schools.

4.1 Descriptive Statistics and Correlation Analysis of Five Latent Variables

The CF was divided into two dimensions in this study, namely, the alternative subscales and control subscales. A first-order confirmatory factor analysis model was applied to the confirmatory factor analysis of cognitive flexibility. Therefore, here, each dimension of cognitive flexibility is regarded as a latent variable, and the descriptive

statistics and related analysis of the five variables are summarised as follows:

The results of the descriptive statistics and correlation analysis are shown in Table 4.1. It can be seen that the means of creativity, intrinsic motivation, perceived teachers' autonomy support, alternative cognitive subscales, and cognitive control subscales were 4.916, 4.957, 5.473, 5.098 and 4.422, respectively, and the standard deviations were .966, 1.282, 1.168, .085, and 1.229, respectively. The correlation coefficients of the five variables were between .257 and .677, all reaching a significance level of .01. Apart from the relationship between cognitive alternative subscales and creativity (r= 0.677, p< 0.01), the correlation of the relationship between the other factors was low. The square root of the AVE of each variable is in the diagonal of Table 4.1. As seen, the square root of the AVE of each variable was greater than the correlation coefficients between the corresponding variable and other variables, which is strong evidence of the discriminant validity of the structure (Fornell & Lacker, 1981).

Table 4.1 Descriptive Statistics and Correlation Analysis of Latent Variables

	M	SD	C	IM	PTAS	AS	CS
Crt.	4.916	.966	(.738)				
IM	4.957	1.282	.450**	(.865)			
PTAS	5.473	1.168	.488**	.497**	(.807)		
AS	5.098	.850	.677**	.388**	.436**	(.780)	
CS	4.422	1.229	.347**	.266**	.257*	.308**	(.696)

Note：*p<0.05; **p<0.01 M for Mean, SD for Standard Deviation. The square root of AVE is in the diagonal.

4.2 Common Method Variance

Common method variance (CMV) means that using the same measurement tool will cause a false common variance between traits, which is common in data

measured by the self-reporting scale (Xiong et al.,2013; Campbell & Fiske, 1959). CMV mainly arises from the same data collection method, the characteristics of the project itself, and the participants' response bias (Podsakoff et al., 2003). The bias caused by CMV is called a common method bias, which is a systematic error that has nothing to do with traits and influences the measurement's validity (Xiong et al., 2012; Richardson et al., 2009; Simmering et al., 2015). Most researchers use Harman's single-factor test and the CFA marker technique to test the CMV (Tang & Wen, 2020).

The data in this study are all derived from a single sample using the self-reporting method. The CMV test was carried out before verifying the model. Harman's single-factor test was utilised in this study. Firstly, an exploratory factor analysis was used to evaluate 46 items of all the variables, in which five factors were extracted without rotating the axis. The cumulative explained variance was 66.06 percent, of which the explained variance of the first factor was 34.87 percent, below the critical value of 40 percent. This showed that the common method bias problem was irrelevant (Podsakof & Organ, 1986; Tang & Wen, 2020). The CFA (Williams et al., 2010), which has been widely used to detect CMV problems, was also used in order to increase the rigour of the research (Astakhova et al., 2017; Bonner et al., 2017; Kovjanic et al., 2012). The specific method involved establishing a single-factor model that included all the items and a five-factors model that consisted of perceived teachers' autonomy, intrinsic motivation, alternative and control subscales of cognition, and creativity. Then, the fitness index and the chi-square increment of the two models were compared to determine if there was a common method bias problem, as shown in Table 4.2. The five-factor model had a better fit index than the single-factor model, and the chi-square incremental value of the two models was 10394.381 (p<0.001), indicating that the five-

factors model was much better than the single-factor one. In summary, the current study has no serious common method bias problem.

Table 4.2 Test of Goodness-of-fit Indictors of the Confirmatory Factor Analysis n=765

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA	$\triangle\chi^2$	$\triangle$df	*p*
One-factor Model	12736.96	989	12.88	.510	.487	.125	10276.88	10	.000
Five-factors Model	2460.08	979	2.513	.938	.935	.044			

4.3Variance Analysis of the Effect of the Family's Socio-economic Status on Crt., PTAS, AS, and CS

4.3.1 Descriptive Statistics of Family's Socio-economic Status

Based on the research of Parsasirat et al. (2013), family income, father's education, and mother's education were used in this study to evaluate the socio-economic status of the participants' family. The descriptive statistics of family's socio-economic status are shown in Table 4.3.

In terms of household income, 2000 yuan was used as the group distance, and the monthly household income was divided into six levels with 36.1 percent of the whole sample having a monthly household income of below 4000 yuan. 25.5 percent of them had a monthly household income of more than 8000 yuan and the monthly household income of 38 percent was 4000-8000 yuan. Therefore, the average monthly household income of the respondent could be calculated as 5654 yuan. According to data from the Shaanxi Province Statistical Yearbook, the per capita monthly disposable income of households in Shaanxi Province was 2055 yuan in 2019, and the average labourer per household was 2.1. Therefore, households' average monthly disposable income could be calculated as 4315.5 yuan (Shaanxi Provincial Statistical Yearbook,

2020). It can be seen from this analysis that the household income level of the survey sample is slightly higher than the average household income level in Shaanxi Province.

With regard to the father's educational level, 63 percent of the students' fathers had a junior high school to high school education, while only 28.3 percent of them had a college degree or above. As for the mother's level of education, 62.8% of them had a junior high to high school diploma, while 27.4 % of them had a college degree or above. Hence, the distribution of the fathers' education was relatively similar to the mothers'.

Table 4.3 Frequency Distribution Table of Family's Socio-economic Status

Variables	Category	Frequency	Effective Percentage （%）	Accumulative Percentage （%）
Family monthly income	Less 2000	65	8.8	8.5
	2000-3999	211	27.6	36.1
	4000-5999	176	23.0	59.1
	6000-7999	115	15.0	74.1
	8000-9999	118	15.5	89.5
	More 10000	80	10.5	100.0
Father's Education	Elementary school	63	8.7	8.7
	Junior-high school	256	35.3	44.0
	High school	201	27.7	71.7
	Undergraduate	181	25.0	96.0
	Postgraduate	24	3.3	100.0
Mother's Education	Elementary school	71	9.9	9.9
	Junior-high school	261	36.3	46.1
	High school	191	26.5	72.6
	Undergraduate	185	25.7	98.3
	Postgraduate	12	1.7	100.0

4.3.2 Variance Analysis of the Effect of the Family's Socio-economic Status on Crt., IM, PTAS, AS, and CS

4.3.2.1 Variance Analysis of the Effect of the Father's Education on Crt., IM, PTAS, AS, and CS

As stated earlier, cognitive flexibility can be divided into two dimensions, namely, alternative and control. This analysis involves the effect of the father's education on creativity, intrinsic motivation, perceived teachers' autonomy support, the cognitive alternative subscale, and the cognitive control subscale. Since there were missing values for the father and mother's education in the research data due to the inclusion of single-parent families, the samples with those missing values were filtered and deleted before subjecting the remaining data to a one-way multivariate analysis of variance (MANOVA). At the same time, since there were just a few postgraduate fathers and mothers, they were merged with the university group. After deleting the missing data of the father's education, the total sample size was 725. The descriptive statistics of the effect of the fathers' different educational levels on each variable are shown in Table 4.4 and the results of the one-way MANOVA are shown in Table 4.5. Firstly, Levene statistics were used to test the homogeneity of variance of each variable divided into different groups by the father's education, and it is evident from the significance of the Levene statistics of the five variables that Crt., IM, PTAS, AC, and CS had equal variance. Then, it can be seen from the p-value of the F statistics in the ANOVA for the five dependent variables that the *p*-value for creativity was .012, and the AS' *p*-value was .034, both of which were less than the statistically significant level of .05.

Based on the above analysis, significant differences were found in the

creativity and alternative subscale of students due to their father's educational levels. This result partially confirms hypothesis H1. Then, the LSD method was used for a post hoc test and the significance level was found to be less than .05. This showed that those students whose fathers had a college degree had significantly higher creativity and cognitive alternative than students whose father's educational level was lower than junior high school. This confirmed hypothesis H1a.

Table 4.4 Descriptive Statistics of the Father's Education on Crt., IM, AS, and CS.

Variables	Educational Level	Frequency	M	SD
Crt.	Elementary school (1st)	63	4.69	1.095
	Junior high school（2nd）	256	4.86	.943
	High school (3rd)	201	4.89	.995
	Undergraduate and above (4th)	205	5.09	.876
IM	1st	63	5.06	1.254
	2nd	256	4.92	1.318
	3rd	201	4.94	1.334
	4th	205	5.00	1.174
PTSA	1st	63	5.46	1.318
	2nd	256	5.44	1.160
	3rd	201	5.45	1.170
	4th	205	5.49	1.135
AS	1st	63	4.90	.999
	2nd	256	3.07	.875
	3rd	201	5.09	.798
	4th	205	5.23	.802
CS	1st	63	4.32	1.236
	2nd	256	4.45	1.200
	3rd	201	4.35	1.190
	4th	205	4.43	1.293

Note: Crt. for creativity, PTAS for Perceived Teachers' Autonomy Support, AS for Alternative Subscale of Cognitive Flexibility, CS for Control Subscale of Cognitive Flexibility, M for Mean, SD for Standard Deviation. 1st for Elementary School, 2nd for Junior High School, 3rd for High School, 4th for Undergraduate and above.

Table 4.5 Summary Table of MANOVA of the Father's Educational Level on Crt., IM, PTAS, AS and CS

Dependent Variables	Levene Statistics	*p*		SS	DF	MS	F	*p*	Post-hoc Tests
Crt.	1.745	.156	Between	10.078	3	3.359	3.694	.012	$4^{th}>1^{st};4^{th}>2^{nd};4^{th}>3^{th}$
			within	655.667	721	.909			
			Total	665.745	724				
IM	1.441	.230	Between	1.447	3	.482	.295	.829	
			within	1177.212	721	1.633			
			Total	1178.659	724				
PTAS	.358	.783	Between	.400	3	.133	.097	.962	
			within	986.869	721	1.369			
			Total	987.269	724				
AS	.450	.717	Between	6.213	3	2.071	2.898	.034	$4^{th}>1^{st};4^{th}>2^{nd}$
			within	515.308	721	.715			
			Total	521.521	724				
CS	.605	.612	Between	3.478	3	1.159	.769	.511	
			within	1086.325	721	1.507			
			Total	1089.803	724	3.359	3.694	.	

Note: Crt. for Creativity, PTAS for Perceived Teachers' Autonomy Support, AS for Alternative Subscale of Cognitive Flexibility, CS for Control Subscale of Cognitive Flexibility. 1^{st} for Elementary School, 2^{nd} for Junior High School, 3^{rd} for High School, 4^{th} for Undergraduate and above.

4.3.2.2 Variance Analysis of the effect of the Mother's Education on Crt., IM, PTAS, AS, and CS

There were 720 samples to be used in the MANOVA of the effect of the mother's education after deleting the missing values. The mother's education was used as a factor and Crt., IM, PTAS, AS, and CS as dependent variables to perform the variance analysis. The descriptive statistics of the above five variables under mothers' different levels of education are shown in Table 4.6, from which it can be seen that 71 mothers had been educated to below elementary school level, 261 to junior high school level, 191 to high school level, and 197 to university level or above. It can be seen from Table 4.5 that the average value of every dependent variable for those groups of students whose mothers were educated to undergraduate level and above was higher than that of the other groups. A MANOVA was needed to confirm if there were significant differences between the groups.

The results of the ANOVA on the Crt., IM, PTAS, AS, and CS of different groups are shown in Table 4.7. Firstly, the dependent variable's ability to meet the assumption of homogeneity of variance in different groups was checked. The results of a Levene statistics test show that Crt., PTAS, AS and CS met the assumption of homogeneity of variance. Then, the significance of the F statistic of creativity (F=3.153, p=.024) and the cognitive alternative (F=3.363, p=.018) reached a statistical significance level of .05. These results indicated that there is a difference between different groups' creativity and cognitive alternative. Finally, a post-hoc test of creativity and cognitive alternative was administered using the LSD method, and according to the results, students whose mothers belonged to the undergraduate degree group had more creativity and cognitive alternative than the other groups. This

confirmed hypothesis H1b.

Table 4.6 Descriptive Statistics of the Mother's Education on Crt., IM, AS, and CS.

Variables	Education Level	Frequency	M	SD
C	1st	71	4.77	1.102
	2nd	261	4.88	.946
	3rd	191	4.83	.994
	4th	197	5.08	.876
IM	1st	71	4.99	1.232
	2nd	261	4.94	1.310
	3rd	191	4.88	1.346
	4th	197	5.04	1.174
PTSA	1st	71	5.33	1.319
	2nd	261	5.45	1.163
	3rd	191	5.36	1.178
	4th	197	5.58	1.135
AS	1st	71	4.96	.961
	2nd	261	5.07	.856
	3rd	191	5.04	.798
	4th	197	5.25	.802
CS	1st	71	4.22	1.243
	2nd	261	4.43	1.197
	3rd	191	4.46	1.196
	4th	197	4.46	1.293

Note: Crt. for Creativity, PTAS for Perceived Teachers' Autonomy Support, AS for Alternative Subscale of Cognitive Flexibility, CS for Control Subscale of Cognitive Flexibility, M for Mean, SD for Standard Deviation. 1st for Elementary School, 2nd for Junior High School, 3rd for High School, 4th for Undergraduate and above.

Table 4.7 Summary Table of MANOVA of Mother's Educational Level on Crt., IM, PTAS, AS and CS

Dependent Variables	Levene Statistics	*p*		SS	DF	MS	*F*	*p*	Post-hoc Tests
Crt.	1.238	.295	Between	8.636	3	2.879	3.153	.024	$4^{th}>1^{st};4^{th}>2^{nd};4>3^{rd}$
			within	653.617	716	.913			
			Total	662.253	719				
IM	2.698	.045	Between	2.795	3	.932	.578	.630	
			within	1154.923	716	1.613			
			Total	1157.718					
PTAS	1.297	.274	Between	6.081	3	2.027	1.484	.217	
			within	977.699	716	1.366			
			Total	983.780	719				
AS	.575	.631	Between	6.999	3	2.333	3.363	.018	$4^{th}>1^{st};4^{th}>2^{nd};4>3^{rd}$
			within	496.707	716	.694			
			Total	503.706	719				
CS	.405	.750	Between	3.382	3	1.127	.744	.526	
			within	1084.595	716	1.511			
			Total	1087.977	719	3.636		.	

Note: Crt. for Creativity, PTAS for Perceived Teachers' Autonomy Support, AS for Alternative Subscale of Cognitive Flexibility, CS for Control Subscale of Cognitive Flexibility. 1^{st} for Elementary School, 2^{nd} for Junior High School, 3^{rd} for High School, 4^{th} for Undergraduate and above.

4.3.2.3 **Variance Analysis of the effect of the Family Income on Crt., IM, PTAS, AS, and CS**

The family income of the samples was divided into six groups with a 2000-yuan group distance. The family income of 65 of the students was less than 2000 yuan, and the family income of 211 of them was between 2000 and 4000 yuan. 176 of them had a family income between 4000 and 6000 yuan, 115 between 6000 and 8000 yuan, 118 between 8000 and 10000 yuan, and 80 above 10000 yuan. The descriptive statistics of Crt., IM, PTAS, AS, and CS in different household income groups are shown in Table 4.8.

Table 4.8 Descriptive Statistics of Family's Income on Crt., IM, AS, and CS.

Variables	Monthly Household Income	Frequency	M	SD
Crt.	Less 2000（1st）	65	4.77	.159
	2000-4000 (2nd)	211	4.96	.065
	4000-6000 (3rd)	176	4.75	.071
	6000-8000 (4th)	115	4.95	.091
	8000-10000 (5th)	118	5.01	.071
	More 10000 (6th)	80	4.98	.109
IM	Less 2000（1st）	65	5.14	.174
	2000-4000 (2nd)	211	5.04	.087
	4000-6000 (3rd)	176	4.90	.097
	6000-8000 (4th)	115	4.69	.127
	8000-10000 (5th)	118	5.04	.110
	More 10000 (6th)	80	4.98	.133
PTSA	Less 2000（1st）	65	5.25	.186
	2000-4000 (2nd)	211	5.52	.078
	4000-6000 (3rd)	176	5.40	.083
	6000-8000 (4th)	115	5.40	.114
	8000-10000 (5th)	118	5.67	.106
	More 10000 (6th)	80	5.48	.113
AS	Less 2000（1st）	65	4.98	.132
	2000-4000 (2nd)	211	5.19	.056
	4000-6000 (3rd)	176	4.96	.069
	6000-8000 (4th)	115	5.05	.075
	8000-10000 (5th)	118	5.26	.068
	More 10000 (6th)	80	5.27	.088

Table 4.8 Continued

Variables	Monthly Household Income	Frequency	M	SD
CS	Less 2000（1st）	65	4.34	.156
	2000-4000 (2nd)	211	4.43	.086
	4000-6000 (3rd)	176	4.24	.088
	6000-8000 (4th)	115	4.44	.117
	8000-10000 (5th)	118	4.57	.109
	More 10000 (6th)	80	4.62	.146

Note: Crt. for Creativity, PTAS for Perceived Teachers' Autonomy Support, AS for Alternative Subscale of Cognitive Flexibility, CS for Control Subscale of Cognitive Flexibility.

Firstly, the five variables were subjected to a MANOVA test to determine if there were significant differences between the groups and the results of the test can be seen in Table 4.9. The F statistics of creativity (F=2.353, p=.035) and AS (F=2.778, p=.017) attained a statistically significant level of .05 in the MANOVA, indicating that students from families with different levels of income have different levels of creativity and cognitive alternative. The identification of variance homogeneity confirmed that the creativity in different groups did not satisfy the variance homogeneity assumption, and that the alternative subscales met that of the variance. Therefore, post-hoc tests of creativity and cognitive alternative were applied using Dunnett's T3 and the LSD method respectively, and the analytical results showed that the fifth group of students were significantly more creative than the third group, the fifth group's cognitive alternative was significantly higher than that of the first and third groups, and the sixth groups was significantly higher than that of the first and third groups. This confirmed hypothesis H1c.

Table 4.9 Summary Table of MANOVA of Different Family Income Levels on Crt., IM, PTAS, AS and CS

Dependent Variables	Levene Statistics	*p*		SS	DF	MS	*F*	*p*	Post-hoc Tests
Crt.	3.532	.004	Between	10.871	5	2.174	2.353	.039	$5^{th}>3^{rd}$
			within	701.495	759	.924			
			Total	712.367	764				
IM	1.066	.378	Between	13.448	5	2.690	1.644	.146	
			within	1241.406	759	1.636			
			Total	1254.854	764				
PTAS	1.765	.118	Between	9.732	5	1.946	1.432	.210	
			within	1031.740	759	1.359			
			Total	1041.472	764				
AS	1.778	.115	Between	9.915	5	1.983	2.778	.017	$5^{th}>1^{st}$; $5^{th}>3^{rd}$; $6^{th}>1^{st}$; $6^{th}>3^{rd}$
			within	541.690	759	.714			
			Total	551.605	764				
CS	.329	.895	Between	12.401	5	2.480	1.649	.145	
			within	1141.790	759	1.504			
			Total	1154.191	764	2.174			

Note: Crt. for Creativity, PTAS for Perceived Teachers' Autonomy Support, AS for Alternative Subscale of Cognitive Flexibility, CS for Control Subscale of Cognitive Flexibility. 1^{st} for Less 2000, 2^{nd} for 2000-4000, 3^{rd} 4000-6000, 4^{th} for 6000-8000, 5^{th} for 8000-10000, and 6^{th} for More 10000.

4.4 Mediating Effect of Cognitive Flexibility on the Relationship Between Intrinsic Motivation and Creativity

The Structural Equation Model (SEM) is a crucial statistical technique widely utilized in disciplines like management and psychology for scientific study. Compared to conventional regression analysis, the SEM may simultaneously build complicated multivariate models and control measurement errors to deliver more accurate analytical results (Wang et al., 2020). Numerous researchers have employed the SEM as a statistical analysis tool used in this study to validate the theoretical model.

When the independent variable "X" must exert its impact on the dependent variable "Y" through the variable "M," "M" serves as the mediating variable, and "X's" influence on "Y" has a mediating effect (Baron & Kenny, 1986). Explaining how "X" influences "Y" through the analysis of the mediation effect shows the "mechanism of X on Y" (MacKinnon & Fairchild, 2009; Wen et al., 2005). In empirical research, developing a mediating effect model is becoming more common. According to Rucker et al. (2011), mediating effect tests were used in 58 percent of the publications published in the Journal of Personality and Social Psychology between 2005 and 2009. Although the Baron and Kenny (1986) causal steps approach is the most popular method to test the mediating effect (Hayes, 2009; MacKinnon et al., 2004), it has drawn criticism for having the lowest statistical power and being limited to the simple mediation model (Fritz & MacKinnon, 2007; Hayes, 2009). (Preacher et al., 2007). In order to "supplement" it, investigators typically use the Sobel test (Hayes, 2009). However, the notion that the product of a and b is a normal distribution, which is challenging to establish, is the foundation for both the causal steps approach and the Sobel test (Bollen

& Stine, 1990; Preacher et al., 2007; Stone & Sobel, 1990). Some academics advise using the Bootstrapping approach, a cutting-edge method for determining the mediating impact that does not require the assumption of a normal distribution (Hair Jr. et al., 2019; Hayes, 2009; Preacher et al., 2007). In order to investigate the mediating effect, the Bootstrapping method is employed in this study. The Bootstrap technique was developed by Shrout and Bolger (2002). They suggested that if the sample size is 765, 2000 samples be randomly chosen and the percentile 95 % confidence interval of the parameter be computed. If the indirect impact's percentile 95% confidence interval does not include zero, the mediating effect is proved to exist. Evaluating the model's fit is a vital step of structural equation modelling because an excellent goodness-of-fit is a prerequisite when estimating the model's parameters (Wang et al., 2020). The fit index of the cognitive flexibility mediation model in this study is shown in Table 4.10 as χ^2 (*df*=624, p<0.001) value is 1664.202, χ^2/df ratio is 2.667, which is less than the recommended threshold value of 3.0. RASEA=.047 and SRMR=.055 are less than the .08 threshold (Hu and Bentler, 1999). The TLI and CFI are more than the recommended threshold of.90, and the GFI value of .891 is very near the acceptable threshold of .90. Therefore, this theoretical model of the cognitive flexibility mediating effect can be accepted.

Table 4.10 Summary Table of Goodness-of-fit of the CF Mediation Model

Model	χ^2（*p*）	df	χ^2/df	RMSEA	SRMR	GFI	TLI	CFI
CF mediating model	1664.22***	624	2.667	.047	.055	.891	.939	.943

The results of the CF mediating effect test are illustrated in Table 4.11. The path coefficients between IM and creativity, between IM and AS, and between IM and

CS are 0.2 (p<.05), 0.39 (p<.05), 0.27 (p<.05) respectively, which indicates that intrinsic motivation has a positive influence on the creativity, AS and CS of junior high school students. Therefore, hypotheses H2 and H3 are confirmed. The path coefficient between AS and creativity is .57 (p<0.05), and between CS and creativity is .13 (p<0.05). These results are evidence that AS and CS positively affect the creativity of junior high school students. Therefore, hypothesis H4 is confirmed.

The Bootstrap approach proposed by Shrout and Bolger (2002) can be used to increase the accuracy of the mediating effect estimation. The indirect effect of the AS is.222 (0.39*0.57) on the association between IM and creativity, and its 95% confidence interval [0.172, 0.278] does not include zero, suggesting that AS has an indirect impact on this relationship. The CS has a .036 (0.27*0.13) indirect effect on the connection between IM and creativity. Its 95 percent confidence interval is [0.015,0.059], suggesting that IM and creativity are indirectly related through CS. The 95 percent confidence interval for the direct effect of IM on creativity is [0.128, 0.273], and it excludes zero. The 95 percent confidence interval [0.382, 0.532] does not cross zero, suggesting the total effect size .458 (.20+.222+.036) obtained statistical significance. According to this research, AS and CS partially mediate the effect of IM on creativity (Table 4.10, Figure 4.1), confirming hypothesis H5. According to Wen et al. (2015), the ratio of the mediation effect to the overall effect can be used to evaluate mediation. The CF's mediation effect size is responsible for 56% of the overall effect. The multivariate correlation square of the dependent variable creativity has an R^2 value.501, demonstrating that intrinsic motivation and cognitive flexibility may account for 50.1% of the variation in creativity.

Table 4.11 Mediating Effect of the CF on the Relationship between IM and Creativity

	St. estimator	Boot SE	*p*-value	Percentile 95% Confidence interval
Direct effect				
IM→Crt.	.200	.036	.001	[0.128, 0.273]
IM →AS	.390	.044	.001	[0.304, 0.474]
IM→ CS	.270	.039	.001	[0.195,0.349]
AS →Crt.	.570	.043	.001	[0.486,0.658]
CS→ Crt.	.132	.037	.001	[0.057,0.203]
Indirect effect				
IM→AS→Crt.	. 222	.028	.001	[0.172,0.278]
IM→CS→Crt.	. 036	.019	.001	[0.015,0.059]
Total effect				
IM→ Crt.	.458	.038	.001	[0.382,0.532]

Note: Crt. for Creativity, PTAS for Perceived Teachers' Autonomy Support, AS for Alternative Subscale of Cognitive Flexibility, CS for Control Subscale of Cognitive Flexibility.

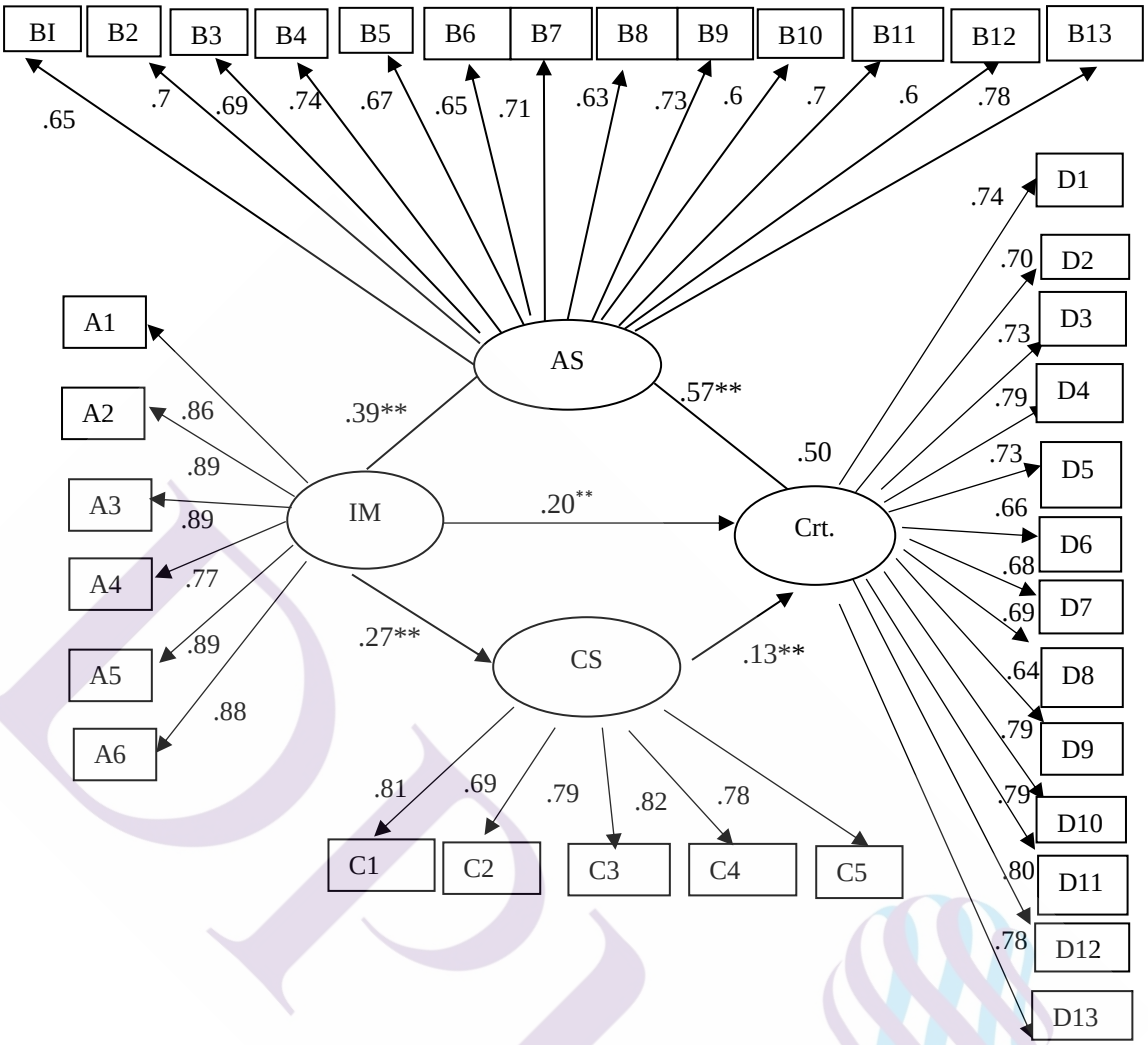

Figure 4.1 Structural Model Diagram of the CF Mediation Effect

Note: Crt. for Creativity, IM for Intrinsic Motivation, AS for Alternative Subscale of Cognitive Flexibility, CS for Control Subscale of Cognitive Flexibility. C for creativity. CFI for cognitive Flexibility Inventory. *p>0.05. **p<0.01.

4.5 Mediating Role of Intrinsic Motivation on the Relationship of Perceived Teachers' Autonomy Support and Creativity

The proposers of SDT (Deci & Ryan, 1985) believe that the provision of autonomous support can maintain or enhance IM and promote recognition of external rules, while situations that are controllable undermine IM and prevent the

internalisation of external rules. Researchers have found that autonomously-supported classrooms are positively associated with students' intrinsic motivation (Deci et al., 1981) and it has been confirmed by this study that IM has a positive effect on the creativity of junior high school students. Therefore, the same verification process as discussed above was utilised to explore the mediating role of IM between PTAS and Crt.. The structural model employed in this verification process is illustrated in Figure 4.2, and the model's fitness index and the results of the mediating role test are shown in Tables 4.12 and 4.13, respectively. Firstly, according to the model's fitness indices, the value of χ^2/df is less than 3 ($\chi 2/df$=2.95), RMSEA=.051, SRMR=.044, which meets the acceptable standard of less than.05. GFI, TLI, and CFI are .911, .954, and .958, respectively, all of which are more than the cut-off criteria. Therefore, these fitness indices show that the theoretical model fits well with the dataset.

Table 4.12 Good-of-fit of the IM mediating model

Model	$\chi^2(p)$	df	χ^2/df	RMSEA	SRMR	GFI	TLI	CFI
IM mediating model	1023.9***	347	2.95	.051	.044	.911	.954	.958

Notes: N=765, IM for Intrinsic Motivation. *** p<0.001.

As illustrated in Table 4.13, the direct path coefficients between PTAS and C and between PTAS and IM are .350 (p<0.01) and .497 (p<0.01), which indicates that PTAS can positively predict the Crt. and IM of junior high school students. The direct path coefficient between IM and C is .276 (p<0.01), which is a statistically significant level of 0.1 and is evidence that IM can positively affect the Crt. of junior high school students. The direct effect of PTAS on Crt. is .350, and the bootstrap percentile 95% confidence interval [.228,.467] does not include zero, indicating that the direct effect is significant. The indirect effect of IM on the relationship between PTAS and Crt. is .137,

and also, the bootstrap Percentile 95% confidence interval [.084,.199] does not include zero. These results indicate that PTAS has an indirect effect on Crt. through IM and, as the confidence interval of the total effect size of .487 also does not include zero, the total effect achieves a statistical significance level. This analysis confirms the following facts:

1. PTAS can positively predict the creativity of junior high school students; therefore, hypothesis H6 is confirmed;

2. PTAS can actively predict the IM of junior high school students; therefore, hypothesis H7 is confirmed;

3. IM plays a partial mediating role between PTAS and junior high school students' Crt.. The direct effect size accounts for 71.87% of the total effect compared to the indirect effect.

Table 4.13 Mediating Role of IM on the Relationship between PTAS and Crt. n=765

	St. estimator	Boot SE	*p*-value	Percentile 95% Confidence interval
Direct effect				
PTAS→Crt.	.350	.059	.001	[0.228,0.467]
PTAS →IM	.497	.038	.001	[0.420,0.569]
IM→ Crt.	.276	.05	.001	[0.180,0.377]
Indirect effect				
PTAS→IM→Crt.	.137	.029	.002	[0.084,0.199]
Total effect				
PTAS→ Crt.	.487	.044		[0.402,0.575]

Notes: IM for Intrinsic Motivation, PTAS for Perceived Teachers' Autonomy Support, Crt. for Creativity.

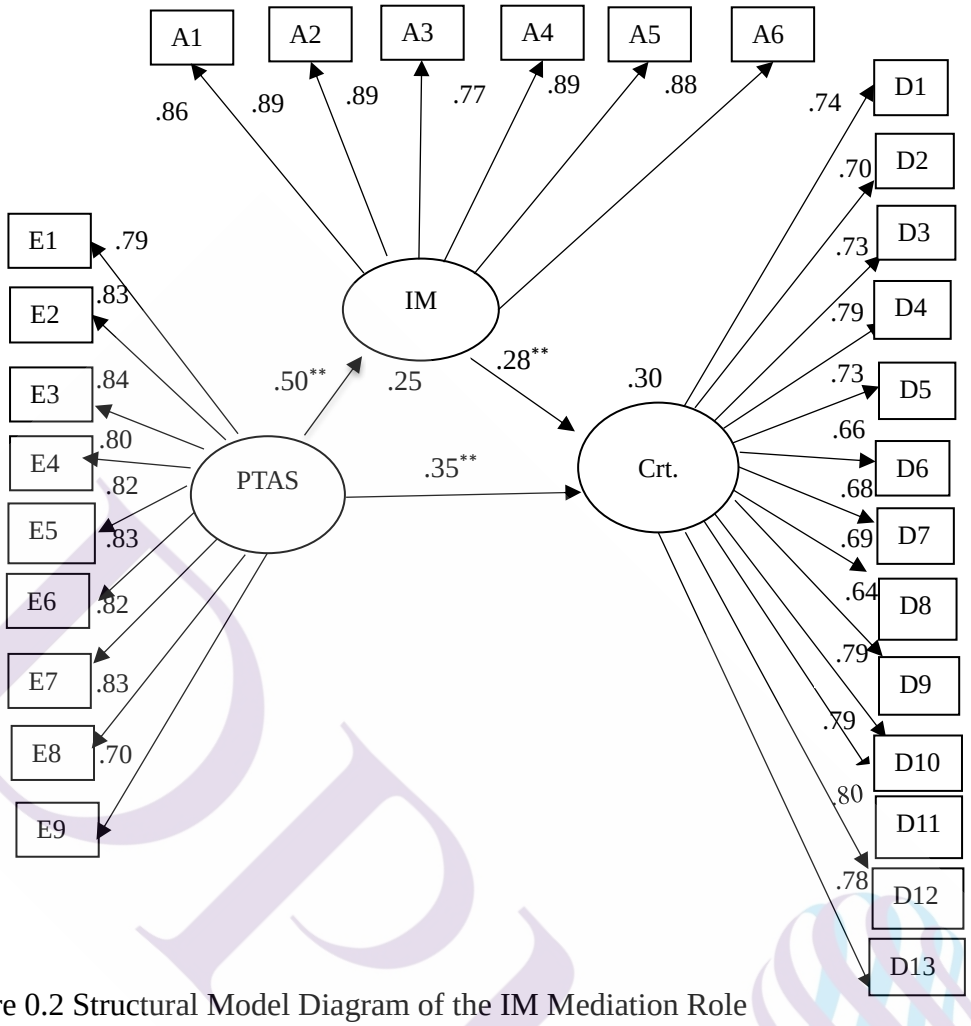

Figure 0.2 Structural Model Diagram of the IM Mediation Role

Note: IM for Intrinsic Motivation, PTAS for Perceived Teachers' Autonomy Support, Crt. for Creativity.

4.6 Indirect Influence of PTAS on Creativity Through IM and CF Sequentially

A serial multiple mediator model that runs from PTAS to Crt. through both IM and CF sequentially, with IM affecting CF was constructed in this study (Hayes, 2013), as illustrated in Figure 4.3. A two-mediator model in which PTAS is modelled as affecting Crt. through four pathways is depicted in Table 4.15. One pathway is

indirect and runs from X to Y only through IM, while a second indirect path runs through both IM and AS sequentially, with IM affecting Crt., and a third indirect path runs through both IM and CS sequentially, with IM affecting Crt.. The remaining path is direct and runs from PTAS to C without passing through IM and AS /CS.

The model fit indices are shown in Table 4.14: χ^2/df =2.605, RMSEA=.046, SRMR =.075. The χ^2/df value is less than 3.0, and the RMSEA and SRMR are both less than the acceptable threshold of 0.08. The GFI value of .869 is close to the standard value of 0.9 and TLI and CFI are respectively greater than the standard 0.9. These results are evidence that the theoretical model is acceptable.

Table 4.14 Summary Table of the Serial Multiple Mediator Model Good-of-fit

Model	χ^2 (p)	df	χ^2/df	RMSEA	SRMR	GFI	TLI	CFI
Serial multiple mediator model	2558.464***	982	2.605	.046	.075	.869	.931	.934

Notes: *** p<0.001.

As illustrated in Table 4.15, all the direct path coefficients of the serial multiple mediator model reached the statistical significance level of 0.05. In terms of the three indirect paths, the size of the effect of one indirect pathway (PTAS→IM→ Crt.) is .067, and the percentile 95% confidence interval [0.029, 0.110] does not include zero. The second indirect path (PTAS→IM→AS→Crt.) has an indirect effect size of .107 with a 95% confidence interval [0.076,0.143] and the third indirect path (PTAS →IM→CS→Crt.) has an indirect effect size of .017 with a 95% confidence interval [0.006,0.029]. It can be seen that all three indirect paths have achieved a statistically significant level of .001. This analysis confirms that IM and CF distally mediate the

relationship between PTAS and Crt.. Therefore, hypothesis H9 is confirmed.

Table 4.15 Analytical Results of the Serial Multiple Mediator Model

	St. estimator	Boot SE	*p*-value	Percentile 95% Confidence interval
Direct effect				
PTAS→Crt.	.185	.049	.001	[0.087,0.283]
PTAS →IM	.504	.038	.001	[0.427,0.575]
IM→ AS	.398	.043	.001	[0.312,0.481]
IM→ CS	.274	.039	.001	[0.199,0.354]
IM→Crt.	.133	.038	.001	[0.058,0.213]
AS→Crt.	.534	.044	.001	[0.488,0.623]
CS→Crt.	.120	.035	.001	[0.050,0.185]
Indirect effect				
PTAS→IM→Crt.	.067	.020	.001	[0.029, 0.110]
PTAS→IM→AS→Crt.	.107	.017	.001	[0.076,0.143]
PTAS→IM→CS→Crt.	.017	.006	.001	[0.006,0.029]
Total effect				
PTAS→ Crt.	.376	.046	.001	[0.280,0.467]

Notes. N=765. PTAS for Perceived Teachers' Autonomy Support, Crt. for Creativity, IM for Intrinsic Motivation, AS for Alternative subscale of Cognitive Flexibility, CS for control subscale of Cognitive Flexibility.

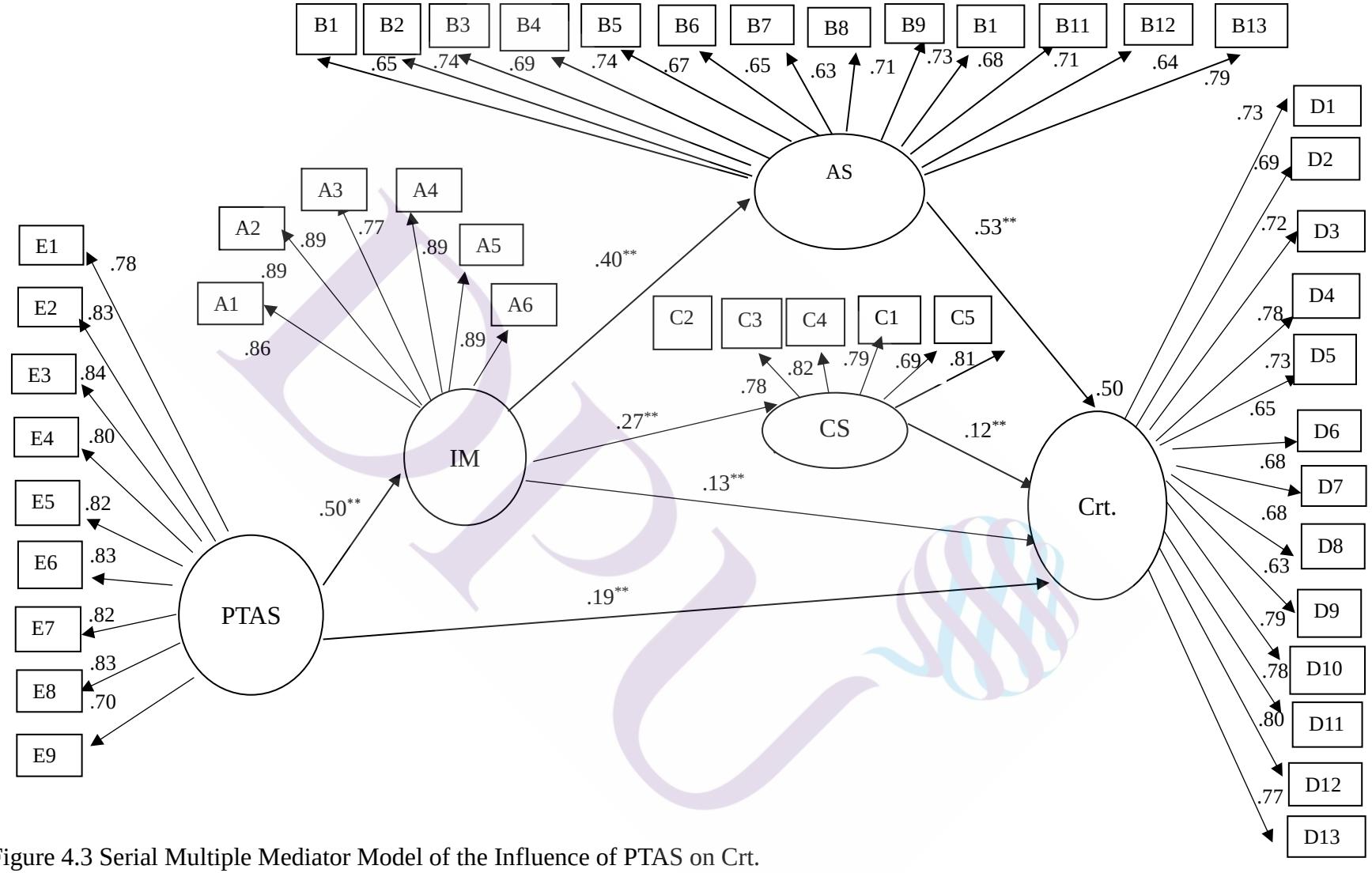

Figure 4.3 Serial Multiple Mediator Model of the Influence of PTAS on Crt.

4.7 Multi-group Comparative Analysis of Urban and Rural Schools

The samples in this study came from 4 junior high schools identified as A, B, C and D. Schools A and B are located in rural areas, while schools C and D are in urban areas. At the stage of primary education in China, there is a massive gap in the distribution of teaching resources between the countryside and cities, with more educational resources allocated to urban schools than to their rural counterparts. This unbalanced distribution of educational resources between countryside and city schools is the subject of a long-standing and widespread debate among scholars (An, 2021; Deng, 2021; Fu & Li, 2020; Gao, 2019). When analysing the data from China's education statistics yearbook, Wen & Gu (2017) discovered that urban schools had more highly qualified teachers, books, laboratory equipment, digital resources, and educational expenditure than rural schools. Teachers influence students' academic performance, schools' teaching infrastructure is determined by educational expenditure, while the lack of books, laboratory equipment, and digital resources undermine students' acquisition of knowledge to improve their performance outside class. This enormous gap between the distribution of educational resources to schools in the cities and countryside leads to few opportunities for rural students to receive higher education. Statistics show that the number of rural students admitted to China's key universities has gradually decreased. Only 10% of the students enrolled in Peking University in 2010 and 17% of those admitted to Tsinghua University in the same year came from the countryside (China Education Statistics Yearbook, 2010).

Yu (2020) analysed the different factors that influence the quality of compulsory education in China between schools in the countryside and those in cities.

The analytical results showed that urban school students' cognitive and non-cognitive abilities were higher than those of rural school students, and the influence of teachers' professional qualification on students' cognitive ability and non-cognitive ability was effectively enhanced in urban schools. When examining the data from the database of the China Education Tracking Survey, Gao (2019) found that urban school students' academic performance was significantly higher than that of rural school students. He also found that students' academic performance declined as their grade increased. In rural schools, the downward trend showed a difference between schools, but none between individual students, whereas in urban schools, there was a difference between individual students but none between schools. This shows that a downward trend in students' performance is more affected by the school factors in rural schools; on the contrary, the downward trend in students' performance in urban schools is more affected by personal factors. It can be surmised from the above literature analysis that the theoretical model constructed in this study may differ between urban and rural schools; therefore, a multi-group SEM was applied to explore this issue.

4.7.1 Analysis of the Difference Between Urban and Rural Schools

An independent sample T-test was firstly applied to evaluate the different Crt., IM, CF, and PTAS in urban and rural schools and the results are shown in Table 4.16. Urban school students (M=5.03) were shown to be more creative than rural school students (M=4.81) and reached statistical significance (t=5.15, p=.002). The IM of urban school students (M=5.21) was found to be higher than that of rural school students (M=4.70) and attained statistical significance (t=5.634, p=.000). the t-values of the different CF and PTAS, between urban and rural students were 1.589 and .675 respectively, which did not achieve statistical significance. These results demonstrate

that students in urban schools and rural schools have different levels of C and IM.

Table 4.16 Independent Sample T-test for Urban Schools and Rural Schools

Variables	Group	M	SD	*t*	*p*
Crt.	Urban school	5.03	1.058	5.150	.002
	Rural school	4.81	.850		
IM	Urban school	5.21	1.205	5.634	.000
	Rural school	4.70	1.307		
CF	Urban school	4.81	.857	1.589	.113
	Rural school	4.71	.813		
PTAS	Urban school	5.50	1.167	.675	.500
	Rural school	5.44	1.169		

Notes: PTAS for Perceived Teachers' Autonomy Support, Crt. for Creativity, IM for Intrinsic Motivation, CF for Cognitive Flexibility.

4.7.2 Cross-validity Test

In order to prevent the structural model and theory from becoming subject to the risk of data-driven generalizations, Hair et al. (2010) proposed the deployment of a multigroup multipattern matching in conjunction with the bootstrap technique. Since the samples in this study came from urban and rural schools, they were divided into an urban group and a rural group based on multigroup multipattern matching in conjunction with the bootstrap technique and subjected to a multigroup analysis to compare the differences between the urban-group and rural-group structural models. According to Ryu (2014), the indirect effects between different groups can be contrasted by conducting a multigroup analysis, in which a moderating variable is used to distinguish the groups that should not appear in the structural model and gradually restrict the parameters of the structural model and set them in order from loose to strict (Byrne, 2016). The models in this study included unconstrained, measurement weights, structural weights, structural covariances, structural residuals, measurement residuals

in order from loose to strict. A significance test was undertaken using the difference in χ^2 between nested models under various constraints in order to determine if the above parameters were reasonable when the two groups were set to be equivalent. The results are shown in Table 4.17, from which it can be seen that the χ^2/df value of each structural model of groups was between 2.220 and 2.314. The value of RMSEA was between .040 and .041, showing that each model is acceptable. In terms of the invariance test, although the significance test of the χ^2 increment for each constrained model was less than .05 compared with the unconstrained model, the NFI increment between each constrained model and the unconstrained model was less than .05. These results meet the invariance standard proposed by Little (1997) and indicate that the structural models for the urban groups and rural groups are equivalent. The structural covariances model can be judged to be the briefest model based on the model with the smallest value in AIC and ECVI as the brief model. This analysis confirms that the structural model proposed in this study has cross-validity.

Table 4.17 Cross-validation Test

Model	CMIN	DF	*p*	CMIN/DF	NFI	RMSEA	AIC	ECVI
1.Unconstrained	4384.544	1964	0.001	2.232	0.837	0.040	4780.544	6.265
2.Measurement weights	4455.919	2005	0.001	2.222	0.834	0.040	4769.919	6.252
3.Structural weights	4468.381	2012	0.001	2.221	0.833	0.040	4768.381	6.250
4.Structural covariances	4468.408	2013	0.001	2.220	0.833	0.040	4766.408	6.247
5.Structural residuals	4540.300	2017	0.001	2.251	0.831	0.040	4830.300	6.331
6.Measurement residuals	4773.567	2063	0.001	2.314	0.822	0.041	4971.567	6.516
2-1	71.375	41	0.002		0.003			
3-1	83.837	48	0.001		0.004			
4-1	83.864	49	0.001		0.004			
5-1	155.756	53	<0.001		0.006			
6-1	389.023	99	<0.001		0.015			

4.7.3 SEM Analysis of Urban and Rural Groups

The SEM of the urban and rural groups was respectively conducted to determine the direct and indirect effects of PTAS on Crt., and the results are shown in Figures 4.5 and 4.6.

4.7.3.1 SEM analysis of Rural Groups

The fitness index of the structural equation model of rural groups is shown in Figure 4.5. The absolute fitness index was χ^2/df=2.431. RMSEA=.061, less than .08, which indicates that the model is acceptable (McDonald and Ho, 2002). AGFI=.765, GFI=.786, and according to Bollen (1990), these two indicators should not be used to determine the model's fit when the sample size is relatively small. Incremental fitness index: CFI=.893, NFI=.831, TLI=.887, IFI=.893. In summary，the theoretical model can be deemed to fit the research data.

As illustrated in Table 4.18, the standardised coefficients of the direct pathway as PTAS→IM, PTAS→Crt., IM→AS, IM→CS, IM→Crt., AS→Crt., and CS → Crt. were .412 (p<0.01), .174 (p<0.05), .325 (p<0.01), .230 (p<0.01), .119 (p<0.05), .501 (p<0.01), .108 (p<0.05) respectively, which all reached a statistical significance level of .05. The 95% confidence intervals of the three indirect paths as PTAS→IM→Crt., PTAS→IM→AS→Crt., PTAS→IM→CS→Crt. were [0.006, 0.148], [0.106, 0.217], and [0.009,0.056] respectively. The confidence intervals of all the indirect paths did not contain zero. These results are evidence of the indirect role of PAST on C through the following three pathways;

1. From PTAS to Crt. across IM;

2. From PTAS to Crt. through both IM and AS sequentially, with IM affecting AS;

3. From PTAS to Crt. through both IM and CS sequentially, with IM affecting CS.

Therefore, it is proved that IM and CF play a mediating role on PTAS and Crt.. The total effect size is .300, the indirect effect size is .126, and the ratio of indirect effects to the total effect is 42%. The R^2 value is .40, indicating that PTAS, IM and CF can explain the 40% variance of the creativity of junior high school students in rural schools.

4.7.3.2 SEM analysis of Urban Groups

The fit between the theoretical models and the dataset is better for the urban group (see Figure 4.5) than the rural group. χ^2/df=2.33, RMSEA=.052, AGFI=.815, GFI=.796, CFI=.913, NFI=.843, TLI=.908, IFI=.813.

Based on Table 4.18, the standardised path coefficients of all the direct paths as PTAS→IM, PTAS→Crt., IM→AS, IM→CS, IM→Crt., AS→Crt. and CS→Crt. were .594((*p*<0.01), .223(*p*<0.01), .447(*p*<0.01), .325(*p*<0.01), .127(*p*<0.05), 0.575(*p*<0.01), 0.141(*p*<0.01) respectively in the urban group, and they also reached a statistical significance level of .05. The 95% confidence intervals of the three indirect paths that matched the rural group also did not include zero, proving that all the indirect pathways are significant in the urban SEM. These results are consistent with those of the rural school SEM analysis and they also prove that IM and CF play a partial mediation role between the PTAS and Crt. of urban junior high school students. The total effect size of the urban group was .473, and the indirect effect size was .255, accounting for 54% of the total effect. The R^2 value was .63, indicating that PTAS, IM

and CFI can explain the 63% variance of urban junior high school students' creativity.

Table 4.18 Bootstrap SEM Analysis of Total, Direct and Indirect Effect

	Rural Schools			Urban Schools		
	Estimate	*p*-value	Confidence Interval	Estimate	*p*-value	Confidence Interval
Direct effect						
PTAS→IM	.412	.001	[0.285,0.520]	.594	.001	[0.511,0.676]
PTAS→Crt.	.174	.026	[0.017,0.318]	.223	.001	[0.096,0.337]
IM→AS	.325	.001	[0.190,0.449]	.447	.001	[0.342,0.556]
IM→CS	.230	.001	[0.129,0.328]	.325	.001	[0.205,0.429]
IM→Crt.	.119	.016	[0.025,0.216]	.127	.038	[0.010,0.246]
AS→Crt.	.501	.001	[0.368,0.624]	.575	.001	[0.473,0.672]
CS→Crt.	.108	.027	[0.012,0.203]	.141	.002	[0.049,0.237]
Indirect effect						
PTAS→IM→Crt.	.049	.012	[0.011,0.098]	.075	.031	[0.006,0.148]
PTAS→IM→AS→Crt.	.067	.001	[0.035,0.012]	.153	.000	[0.106,0.217]
PTAS→IM→CS→Crt.	.010	.020	[0.001,0.025]	.027	.027	[0.009,0.056]
Total effect						
PTAS→Crt.	.300	.001	[0.148,0.436]	.473	.001	[0.370,0.573]

Notes：PTAS for Perceived Teachers' Autonomy Support, C for Creativity, IM for Intrinsic Motivation, AS for Alternative subscale of Cognitive Flexibility, CS for control subscale of Cognitive Flexibility.

4.7.4 Comparison of the Path Relationship Between Variables Associated with Urban and Rural Schools

The vital function of a multi-group analysis is to estimate and compare the paths in the structural model of different groups (Wu, 2010). The different path coefficients between the SEM of the urban and rural groups were tested in this study based on the analytical process of Chang and Jaisook (2020) and the results can be seen in Table 4.19. The estimator in Table 4.19 represents the non-standardised path coefficient of the SEM of urban and rural schools, and CR represents the Critical Rations for the differences between pairwise path coefficients in the SEM of urban and

rural groups. A CR value of more than 1.96 indicates a significant difference at the .05 significance level. As can be seen from Table 4.19, the CR values of the path coefficient between PTAS and IM were 2.905, which demonstrated a significant difference in the SEM of urban and rural groups. This means that the influence of PTAS on IM is greater for urban students than their rural counterparts. The research hypothesis H10 is supported.

Table 4.19 Path Comparison of Urban Schools and Rural Schools

	Rural Schools		Urban Schools		
	Estimate	*p*-value	Estimate	*p*-value	CR
Direct effect					
PTAS→IM	.442	.000	.687	.000	2.905**
IM→AS	.168	.000	.241	.000	1.709
IM→CS	.210	.000	.263	.000	0.782
PTAS→Crt.	.135	.000	.157	.000	0.417
AS→Crt.	.707	.000	.647	.000	-0.546
CS→Crt.	.086	.018	.106	.000	0.416
IM→Crt.	.086	.023	.077	.017	-0.189

Notes: PTAS for Perceived Teachers' Autonomy Support, Crt. for Creativity, IM for Intrinsic Motivation, AS for Alternative subscale of Cognitive Flexibility, CS for control subscale of Cognitive Flexibility.

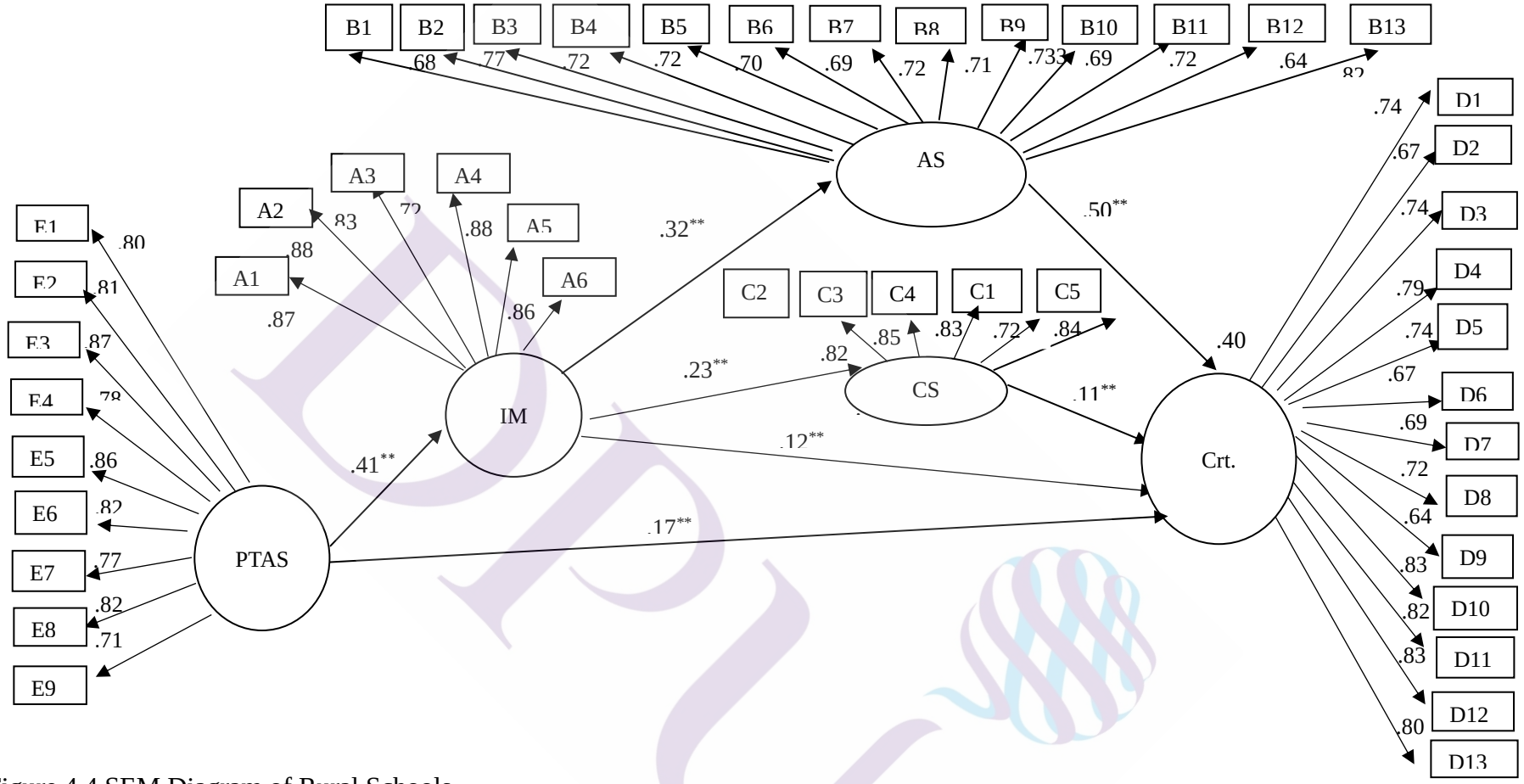

Figure 4.4 SEM Diagram of Rural Schools

Note: PTAS for Perceived Teachers' Autonomy Support, Crt. for Creativity, IM for Intrinsic Motivation, AS for Alternative subscale of Cognitive Flexibility, CS for control subscale of Cognitive Flexibility.

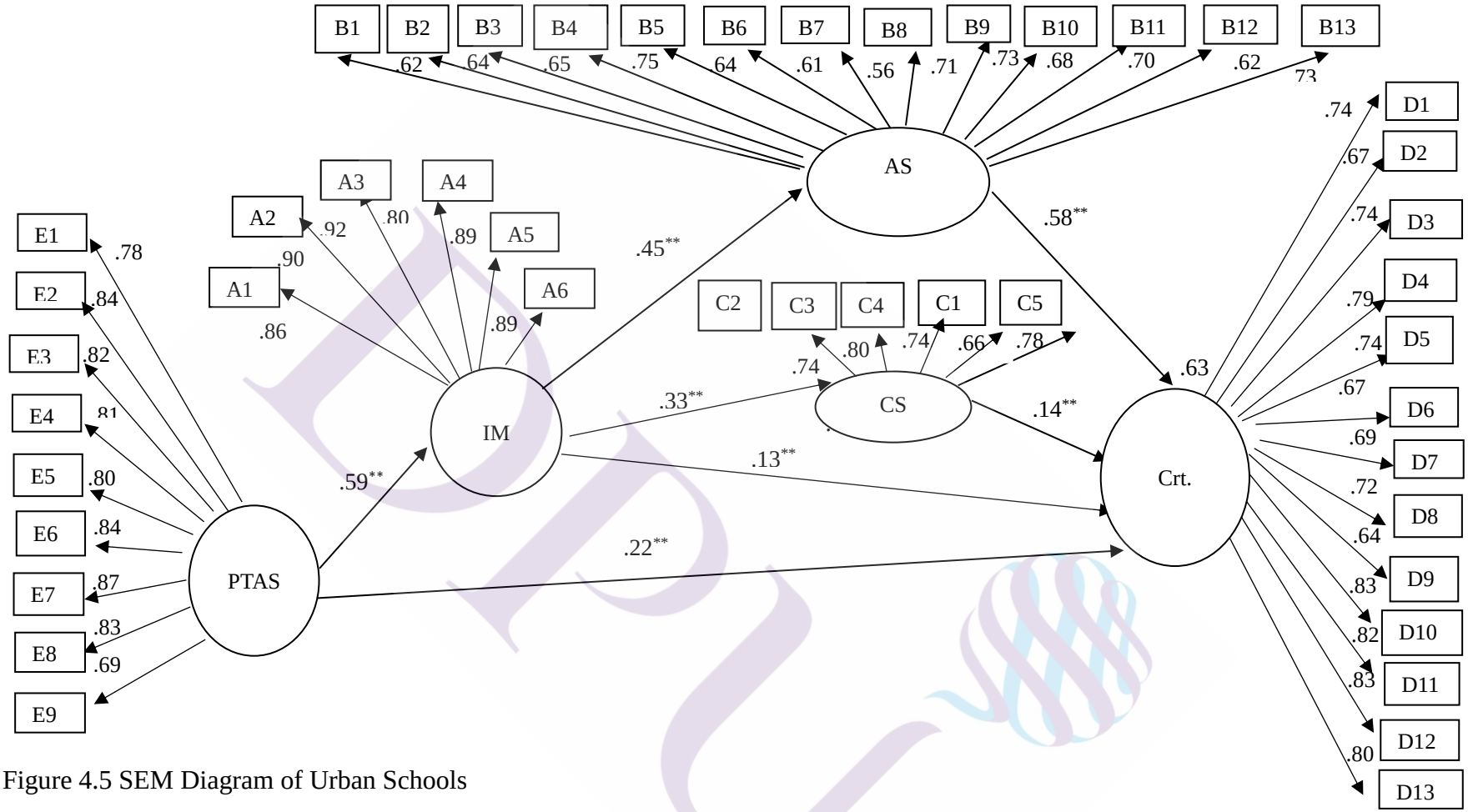

Figure 4.5 SEM Diagram of Urban Schools

Note: PTAS for Perceived Teachers' Autonomy Support, Crt. for Creativity, IM for Intrinsic Motivation, AS for Alternative subscale of Cognitive Flexibility, CS for control subscale of Cognitive Flexibility

4.8 Summary of Hypothesis Verification

The research hypotheses proposed in this study are analysed and examined through multivariate analysis of variance, structural equation modelling and multi-groups comparative analysis. The results of the research hypotheses are summarized and shown in table 4.20.

Table 4.20 Summary of Hypothesis Verification

	Hypothesized paths	Results
H1	There are significant differences in the IM, CF, PTAS and creativity of junior school students from families with a different SES.	Accepted
H2	Intrinsic motivation has a significant impact on the students' creativity of junior high school.	Accepted
H3	Intrinsic motivation has a positive effect on students' CF.	Accepted
H4	Cognitive flexibility has a positive predictive effect on students' creativity.	Accepted
H5	Cognitive flexibility plays a mediating role in the relationship between IM and creativity.	Accepted
H6	PTAS has a positive impact on students' creativity.	Accepted
H7	PTAS can have a significant impact on students' IM.	Accepted
H8	Intrinsic motivation plays a mediating role between PTAS and the creativity of students	Accepted
H9	Intrinsic motivation and cognitive flexibility play a distal mediating role between PTAS and the students' creativity.	Accepted
H10	The theoretical model constructed in this study will illustrate the difference between China's urban schools and rural schools.	Accepted

CHAPTRE 5

DISUSSION

The aims of this study were to investigate students' perception of teachers' autonomy support, to analyse the effect of students' intrinsic motivation and cognitive flexibility on their creativity, and to evaluate the impact of intrinsic motivation and cognitive flexibility on the relationship between teachers' autonomy support and creativity. The most interesting findings from the study are discussed below.

5.1 There Are Significant Differences in Creativity and Cognitive Flexibility among Students with Different SES of Family

The Socio-economic Status (SES) of the families of the students in this study was assessed based on the educational background of the father and mother and the family's monthly income. The findings indicated that the creativity test scores of students from families with a high SES were better than those of students whose family had a low SES. This result corresponds with that of previous researchers (Castillo-Vergara *et al.*, 2018; Dai *et al.*, 2012). As a result of their study, Lüdeke *et al.* (2020) reported that children and adolescents from families with a low SES obtained lower creativity test scores than those whose families had a higher SES, which followed the findings of Castillo-Vergara *et al.* (2018), that students' creativity test scores positively correlated with their families' SES. They observed that students from families with a low SES lacked creativity due to fewer high-quality educational resources and less participation in extracurricular activities designed to develop creativity. Bradley and Corwyn (2002) also agreed that better-educated parents can provide their children with more excellent support and cognitive stimulation than parents of children from

socially-disadvantaged homes. Parents with a better level of education can also engage frequently in various intellectual activities with their kids (Guo & Harris, 2000), thereby indirectly promoting their creativity (Dai et al., 2012). Moreover, as a result of conducting a longitudinal study, Jankowska and Karwowski (2018) found that the SES of children's family has a positive relationship with the initial level of their creative thinking (T1), independent of development gains (T1–T3). This implies that students from families with high SES emerge as creative thinkers at first, but higher SES does not translate into a constant increase of creativity. The reason for this may be explored in future research.

It was also indicated in this study that the cognitive alternative of students from families with high SES is significantly better than that of students whose families have low SES. Cognitive alternative is a feature of cognitive development that illustrates an individual's ability to identify alternative explanations and generate multiple solutions in certain situations (Dennis & Vander Wal, 2010). Some researchers have found that children's cognitive developmental trajectories are significantly affected by their own family's SES. According to Feinstein (2003), children from families with a low SES scored high on cognitive tests at 22 months, but at 5 years old, they had been replaced by children from families with a high SES, whose cognitive test results were lower on the baseline test. This example indicates that families' high SES may positively affect children' cognitive development. Using Growth Mixture Models to analyse a sample of children from the UK, Sindall et al. (2019) found that those who initially belonged to low-score cognitive test groups, but improved over time, were more likely to be in high-SES groups. Conversely, they observed that children who start with high initial scores, but subsequently decline, are likely to be in low-SES groups.

Therefore, it can be speculated that the cognitive development of children from families with a high SES is more likely to improve as they grow up and overtake children from families with a high SES.

5.2 Intrinsic Motivation Has a Positive Effect on Junior High School Students' Creativity

It was found in this study that junior high school students' intrinsic motivation has a positive effect on their creativity, which corresponds with the research of Deci and Ryan (1985). Eisenberger and Shanock (2003) were able to verify that creativity and intrinsic motivation have a positive relationship. Intrinsic motivation propels people to engage in an activity out of interest, enjoyment, satisfaction, and the challenge of the activity itself (Amabile et al., 1996; Amabile & Mueller, 2008; Amabile & Pillemer, 2012), and then it drives them to devote their efforts to creative processes by increasing their interest and enjoyment in the work (Amabile, 1996). Liu et al. (2016) believe that intrinsic motivation generates "an incentive force eager to do," which arouses curiosity, interest and enjoyment in the task, hence affecting creativity. It has been confirmed in the literature that intrinsic motivation can significantly and positively predict students' creative performance (Gu et al., 2015). Furthermore, Cheng et al. (2021) verified that intrinsic motivation positively affects the creativity of gifted children. This study took Chinese junior middle school students as the research object and confirmed that students' intrinsic motivation positively affects their creativity. This research conclusion once again provides evidence that inherent motivation as an individual trait actively influences creativity in the context of Chinese culture.

5.3 Intrinsic Motivation Has a Positive Effect on Junior High School Students' Cognitive Flexibility

One interpretation of cognitive flexibility is an individual's capacity to quickly adapt to shifting environmental demands in any challenging situation (Martin & Rubin, 1995). According to academics, intrinsic drive frequently affects a person's propensity to be flexible (Richmond & McCroskey, 1989). When people are free to pursue their inner interests, they engage in activities naturally and spontaneously (Deci, 1975); in other words, intrinsic motivation encourages people to engage in an activity. According to Li et al. (2018), people with intrinsic motivation can focus their attention on cognitive tasks in various ways.

Amabile (1996) contends that people's intrinsic motivation is sparked by positive responses to the work, such as interest, participation, curiosity, satisfaction, or a positive challenge. However, Løvoll et al. (2017) contend that intrinsic motivation can heighten pleasant emotions. Lyubomirksy et al. (2005) concluded that individuals who enjoy what they do are more likely to create extensive links within their existing knowledge structure, increasing their likelihood of flexibility. De Dreu et al. (2008) demonstrated that positive moods promote cognitive flexibility. It may be inferred from these research results that the positive emotions may mediate the impact of intrinsic desire on creativity. This study confirms the positive relationship between intrinsic motivation and cognitive flexibility. This conclusion provides a literature basis for further exploring whether the role of intrinsic motivation on creativity can be realized through cognitive flexibility.

5.4 Cognitive Flexibility Has a Positive Effect on Junior High School Students' Creativity

This study discovered that cognitive flexibility benefits junior high school students' creativity. Prior research has shown that cognitive flexibility can predict how well different activities, including creative ones, would be accomplished (Heinze et al., 2009; Jonassen, 2011; Vartanian, 2009). Studies in the realm of creativity have demonstrated that there are two avenues to creativity: flexibility and persistence (Nijstad et al., 2010). Using multiple categories and switching between them frequently are indications of cognitive flexibility, according to Nijstad et al. (2010). According to Nijstad et al. (2010), utilizing numerous categories and moving between them frequently are signs of cognitive flexibility. It was described by Barbey et al. (2013) as the interaction of several systems in response to various demands. The ability to transition between categories, techniques, and sets by using distant (rather than near) associations are characterized by cognitive flexibility. It is the capacity to generate ideas, solve issues, and arrive at creative discoveries through broad and inclusive cognitive categories (Eysenck, 1993). So it is generally accepted that cognitive flexibility is necessary for problem-solving and creativity (Kloo et al., 2006; Ghacibeh et al., 2006; Nijstad et al., 2010).

In this study, cognitive flexibility is operationalized into alternative and control dimensions, and the findings indicate that these sub-factors benefit junior high school students' creativity. As opposed to cognitive functioning, which refers to a person's capacity to see challenging circumstances as manageable, cognitive alternatives are often seen as individuals' capacity to recognize various causes for a situation and develop multiple solutions (Dennis & Vander Wal, 2010). According to

scholars, creativity is frequently interpreted as breaking sets or overcoming "functional fixedness" (Simonton, 1999) and reframing the connections between different ideas (Smith & Blankenship, 1991). The connections made above stand in for the alternative attribute of cognitive flexibility. Accordingly, cognitive control seems to be able to evaluate more self-efficacy-based beliefs and emphasize people's confidence in their ability to handle challenging circumstances (Johnco et al., 2014). According to the cognitive assessment hypothesis, individuals will have good feelings if they believe that the threats or problems they face can be managed and that they have the skills and resources necessary to deal with them (Lazarus, 2006). Consequently, Fredrickson (2013) thinks that feeling good helps with creativity.

5.5 Cognitive Flexibility Mediates the Relationship Between IM and Junior High School Students' Creativity

It was verified by this study's findings that cognitive flexibility is a mediator between IM and students' creativity. Since there are no overlapping studies, this finding makes a valuable contribution to the study of creativity. Cognitive flexibility, which is defined as individuals' ability to structure new alternatives when they experience difficult situations and employ those alternatives in practice, has been associated with personality traits (Compton, 2000) when previous researchers explored the relationship between CF and IM (Deci, 1971; Ryan & Deci, 2000). For instance, Deci (1971) interpreted intrinsic motivation as a robust cognitive dimension related to people's perception of their ability to behave in the surrounding environment. Nickerson (1998) proposed that the cognitive process is driven by personal desire, and people have a disposition to selectively perceive, encode and keep information consistent with their desire. Therefore, strong intrinsic motivation ignites people's desire to explore and

challenge the status quo (Ryan & Deci, 2000). De Dreu et al. (2011) discovered the existence of a positive relationship between behavioural activation and CF, and Deci and Ryan (2001) found that IM was positively correlated to students' cognitive flexibility.

After finding that IM and CF have a positive effect on the creativity of junior high school students, a further step was taken to support the mediator role of CF in the relationship between IM and creativity. The mediator effect of cognitive flexibility's alternative and control sub-dimensions between these variables was also compared. Lin et al. (2014) examined the mediating role of CF in an emotion–creativity relationship and found that a positive affect could increase CF and creativity and CF mediates the relationship between college students' positive emotion and creativity. The dual pathway to the creativity model implies that any personality trait or emotional state that increases CF has the potential to increase creativity through the flexibility pathway (De Dreu, Baas, & Nijstad, 2008). As a personal trait, middle-school students' IM may enhance their creativity by improving their CF. Shao et al. (2018) demonstrated that flexible processing plays a pivotal role in the relationship between approach motivation and creativity. Baas et al. (2011) showed that approach motivation promotes creativity because it is interrelated to enhanced CF. Prior researchers emphasized the role of IM in enhancing creativity, but the existing literature on how and why intrinsic motivation is connected to creativity is fragmented. The motivation-cognitive model that demonstrates the effect of intrinsic motivation on creativity via the alternative and control sub-dimensions of CF was investigated in this study and it was found that the mediating role of alternative cognitive flexibility is more significant than that of the control dimension.

5.6 Perceived Teachers' Autonomy Support Has a Positive Effect on Junior High School Students' Creativity

Many researchers have emphasised the importance of the autonomy support of parents, teachers and friends for students (Deci & Ryan, 2008; Paramitha & Indarti, 2014; Ryan & Deci, 2000a; Simon & Salanga, 2021; Whaley, 2012). In their study, Vasquez et al. (2016) employed a meta‐analysis and revealed that adolescents' academic achievement and psychological health are associated with the autonomy support of their parents. Su and Reeve (2011) agreed that teacher autonomy support is vital to develop a positive academic performance. Reeve and Jang (2006) observe that teachers who provide autonomy support communicate with students based on empathy, encourage them to be independent, give them a choice and respond to their expectations. Alivernini et al. (2019) found that students in an autonomy‐supportive classroom experience better well-being. Perceived teacher autonomy support refers to students' perception of how their teachers provide support for their need for autonomy. An autonomy-supportive learning environment in which teachers give students choices, support and resources to enhance their autonomy enables them to feel confident in their learning; hence, it can stimulate their enthusiasm and motivation to learn, leading to better learning outcomes.

The finding in this study that PTAS has a positive effect on students' creativity corresponds with the results of previous studies (Gu et al., 2015; Huang & Chan, 2018; Zhu, 2019). Gu et al. (2015) analysed the relationship between supervisory styles and the creativity of 216 graduate students in China and operationalised supportive supervisory styles, such as personal support, academic support, and

autonomy support. Their findings illustrated that a supportive supervisory style has a positive effect on graduate students' creativity. Similarly, the results of other studies in China have also affirmed that the mentor's autonomy support has a positive association with postgraduate students' creativity (Huang & Tan, 2018; Zhu, 2019).

Many studies of the relationship between teacher autonomy support and students' creativity have been conducted among China's college and graduate students. However, only a few of them were focused on exploring the effect of school support on pupils' creativity, but none of them involved the use of middle-school students to analyse the relationship between teacher autonomy support and creativity. Zhang *et al.* (2020) and Sha (2017) examined the effect of school support on the creativity of students in the 4th to 6th grades. In their investigation, school support referred to emotional and academic support from teachers and peers, and the results illustrated that a supportive school environment has a positive influence on primary school students' creativity. The finding of the present study is consistent with that of earlier researchers and expands the related research of the effect of supportive environmental factors on individuals' creativity.

5.7 Perceived Teachers' Autonomy Support Has a Positive Effect on Junior High School Students' Intrinsic Motivation

As outlined above, teachers' autonomy support plays a central and positive role in educational practices, especially for students, by satisfying their psychological need for autonomy (Huan & Tan; Ma, 2021; Reeve & Jang, 2006; Zhang et al., 2021; Zhao & Qin, 2021). Based on the Self-determination Theory (SDT), individuals have a higher level of IM when the psychological needs of autonomy, competence and

relatedness have been met (Ryan & Deci, 2000a). A growing volume of empirical literature is devoted to examining the effect of teacher autonomy support on students' IM, and the findings of this study are consistent with those of many prior researchers (Chen et al., 2015; Gu et al., 2015; O'Reilly, 2014; Paramitha & Indarti, 2014). 16 studies that involved a meta-analysis of the relationship between autonomy support and motivation were found to demonstrate a positive relationship between PTAS and IM, and an assessment of the strength of the relationship ranged from 0.22 to 0.69 (Cor, 2008). Gillet et al. (2012) studied a sample of 1600 students aged 7-19 years, and found that teacher autonomy support and students' intrinsic motivation had a positive relationship. Teachers who promote autonomy provide students with choices, allow them freedom to decide how to learn, and give them timely feedback (Reeve & Jang, 2006). Chatzisarantis et al. (2007) found that perceived teacher autonomy indirectly affects intrinsic motivation via attitude. Many researchers have demonstrated that higher perceived teacher autonomy amplifies intrinsic motivation (Black & Deci, 2000; Griffin, 2016; Ljubin-Golub et al., 2020).

The results in this study not only confirm the conclusions of previous studies on PTAS and IM but also compares the impact of PTAS on students' IM between urban schools and rural schools through multi-group comparison and find that urban school students' perceived teacher autonomy support has a more substantial positive impact on their internal motivation.

5.8 Intrinsic Motivation Plays a Mediating Role Between Perceived Teachers' Autonomy Support and Junior High School Students' Creativity

Once again, the results of this study confirm the significant and positive

impact of PTAS on students' creativity and IM. Previous researchers have found that students' perceived autonomy correlates positively with their interest, enjoyment and performance. For example, Reeve and Jang (2006) observe that autonomy-supportive instruction behaviour is significantly correlated with students' perceived autonomy. According to Jang et al. (2010), autonomy-supportive instruction relies on non-controlling utterance and acknowledging students' perspective and feelings to nurture their inner motivation resources. The positive effects of teachers' autonomy support in teaching practice have been verified by prior researchers, who have found that students have higher academic intrinsic motivation (Deci et al.,1981) and positive emotionality (Ryan & Connell, 1989) when their teachers are supporting-autonomy. Based on the broaden-and-build theory of positive emotions, individuals with positive emotions have an unusual, flexible, inclusive and creative mindset. Moreover, their tendency to act is expanded by an increased tendency to seek diversity and remain open to behavioural choices (Fredrickson, 2013), thereby enhancing their creativity.

Previous researchers have explored the effect of motivation on autonomy support and creativity and, as expected, it was confirmed in this study that intrinsic motivation mediates the indirect effect of perceived teachers' autonomy support on creativity. Gu et al. (2015) tested the indirect effect of a supportive supervisory style on students' creativity and were able to prove that intrinsic motivation acts as a mediator between an autonomy-supportive supervisory style and creativity. In terms of supervisor support and co-worker support, Paramitha and Indarti (2014) found that intrinsic motivation acted as a mediator between supervisors' support and employees' creativity.

Furthermore, teachers' autonomy support can produce many positive

educational outcomes. Many empirical researchers have confirmed the mediating role of intrinsic motivation between teachers' autonomy support and positive educational outcomes. Griffin (2016) determined that IM plays a mediating role between students' PTAS and their instruction ratings. The results of a study of Chinese junior middle-school illustrated that autonomous motivation acts as a mediator between PTAS and academic engagement (Chen et al., 2015). Wang and Zhao (2022) used a meta-analysis to summarise the effects of teachers' autonomy support and students' academic achievement and found that academic motivation mediates the effect of the former on the latter. Consistent with the aforementioned investigations, it was proved in this study that intrinsic motivation plays a critical mediating role in the relationship between teachers' autonomous support and positive educational outcomes, such as students' creativity. This finding provides empirical evidence of the SDT and the componential theory of creativity, the latter of which emphasises the importance of intrinsic motivation and environmental factors to creativity. The influence of autonomy-supporting environmental factors and intrinsic motivation on creativity was tested in this study and the results supported the conclusion of the componential theory of creativity that individuals' internal factors mediate the effect of environmental factors on creativity.

5.9 Intrinsic motivation and Cognitive Flexibility Play a Distal Mediating Role Between Perceived Teachers' Autonomy Support and Junior High School Students' Creativity

It was concluded in this study that IM and CF play a distal mediating role between PTAS and junior middle-school students' creativity, thereby proving Amabile's

componential theory of creativity and the eco-systems model of creativity. According to both of these theories, individuals' creativity is affected by their individual characteristics and environmental factors, and the latter have an indirect effect on their creativity via individual factors. Empirical studies have confirmed that individual factors, such as intrinsic motivation (Bodla & Naeem, 2014; Fredrickson, 1998; Zhang & Gheibi, 2015), cognitive style (Ghacibeh et al., 2006; Lin et al.,2014; Nijstad et al., 2010; Shalley et al., 2004) and thinking skills (Isabel et al., 2022; Izabela et al., 2021; Xia et al., 2021) affect creativity. However, researchers pay more attention to the effect of family and school on students' creativity; for instance, parenting styles (Banerjee & Halder, 2021; Mehrinejad et al., 2015; Zhang *e*t al., 2013) and teachers' autonomy support (Deci & Ryan, 2008; Huang et al., 2018; Koestner *et al.*, 1984; Ryan & Deci, 2000a; Whaley, 2012). These prior researchers have proved that a supportive teaching environment directly and positively affects students' creativity by enhancing their intrinsic motivation (Chen et al., 2015; Griffin, 2016; Wang & Zhao, 2022).

According to the proponents of the self-determination theory, meeting individuals' need for autonomy helps to boost their intrinsic motivation, which is the driving force for them to participate in an activity out of curiosity, interest, desire, satisfaction, and a wish to challenge the status quo (Deci & Ryan, 1985; Ryan & Deci, 2000a). When individuals participate in an activity driven by intrinsic motivation, they are more likely to demonstrate creative thinking, openness to new experiences, cognitive flexibility, willingness to take risks, and endurance, which indicates a higher level of creativity. This theoretical path illustrates that an autonomy-supportive teaching environment may affect students' creativity via intrinsic motivation and cognitive flexibility. Empirical methods were used in this study to examine the mediating role of

intrinsic motivation and cognitive flexibility in the relationship between perceived teachers' autonomy support and students' creativity. According to the results, the mediating path had a more significant impact on creativity than the direct path, thereby highlighting the importance of intrinsic motivation and cognitive traits to creativity. This implies that, in practice, teachers should pay attention to the factors that affect students' intrinsic motivation and cognitive flexibility when building an autonomy-supportive teaching environment.

5.10 Perceived Teacher Autonomy Support Has a Significantly Different Effect on the Intrinsic Motivation of Students in Rural and Urban schools

The ultimate purpose of the investigation is to compare the discrepancy in the effect of PTAS on students' creativity between urban and rural schools. The study results showed that urban students have significantly more intrinsic motivation and creativity than their rural counterparts. A multi-group comparative analysis was then employed to examine the discrepancy of the overall model between urban and rural schools, and it was concluded that PTAS had a more significant effect on the intrinsic motivation of urban students than that of urban students.

A search for teacher autonomy support as a subject gained 31 pieces of literature from China's most extensive literature database during the last ten years. Most of these studies consisted of an analysis of the relationship between teacher autonomy support and academic achievement (Wang, 2021），learning engagement (Jiang et al., 2021), motivation, psychological needs, and school adjustment (Xing et al., 2021). Only five of them examined the effect of supervisors' autonomy support on postgraduates' creativity, and one literature discussed how teachers' autonomy support

affects primary students' creativity. Only four of these studies were based on an analysis of the mediating role of self-efficacy and motivation between teachers' autonomy support and students' creativity. Therefore, in the Chinese context, no researchers have examined the indirect influence of teachers' autonomous support on junior school students' creativity based on two sequential variables, and this study fills this gap. In other words, the hypothesis that teachers' autonomy support indirectly affects students' creativity mediated by IM and CF was tested in this study and compared between urban and rural schools.

Influenced by its typical dual urban-rural structure (Lu & Yang, 2013; Xiao, 2005). China's educational capital investment, educational infrastructure, and distribution of teachers are imbalanced between urban and rural areas. One of the manifestations of this imbalance is the concentration of high-quality teaching resources in cities, while rural areas tend to lack educational resources like excellent teachers (Ren Li, 2016). Although previous studies have confirmed that teachers' autonomy support positively affects students' IM, the impact between urban and rural areas was examined in this study and it was found that PTAS had a stronger impact on the intrinsic motivation of urban students than that of rural students.

Urban students have broader knowledge and vision, plenty of experience and a higher level of satisfaction and autonomy than their rural counterparts. Therefore, even if urban and rural students perceive the same level of teacher autonomy support, the former's intrinsic motivation is significantly higher than that of the latter. Therefore, the effect of teacher autonomy support on IM is more potent in urban schools than in rural schools.

CHAPTER 6

CONCLUSION

The contents of this chapter mainly include a description of the study's theoretical and practical significance based on the data analysis in Chapter 4 and the discussion of the results in Chapter 5. Implications and recommendations for educational practice are made in this chapter and the research limitations are also mentioned, along with some suggestions for future research. The following sections contain a detailed discussion of these different aspects.

6.1 Theoretical and Practical Significance of the Study

Ten hypotheses on the impact of perceived teachers' autonomy support on junior middle-school students' creativity were tested in this study based on a literature review and related theories. A total of 765 middle-school students were investigated using the following four scales: PTAS, IM, CF, and creativity. The results of the data analysis confirmed that all ten hypotheses were supported. The theoretical significance of this study is illustrated below.

6.1.1 Theoretical Significance of the Study

1. This study provides an example of empirical research methods to investigate the relationship between PTAS and the creativity of middle-school students in western China.

As mentioned earlier, there is a lack of studies of the relationship between teachers' autonomy support and junior high-school students' creativity in the Chinese context (Lockette, 2013). Previous studies of teachers' autonomy support in China were only focused on college students or graduates (He et al., 2019; Qi & Hu, 2016b; Zhang et al., 2015). Therefore, this study aims to fill this gap in the literature with an investigation of the relationship between PTAS and the creativity of junior high-school students in China.

Firstly, the research participants were junior high-school students from Shaanxi province in Western China, where there is relatively low economic development. The reason for choosing Shaanxi province as the focus of the study is that contemporary research on primary and middle-school students' creativity is mainly focused on China's south-eastern region, which is economically developed, and there are few studies of the economically-underdeveloped western region. By conducting this research against the environmental background of Shaanxi Province in an economically-underdeveloped area, the findings can provide a useful reference for cultivating the creativity of students in other economically-underdeveloped areas in China.

Secondly, middle-school stage is crucial for cultivating students' creativity, and the classroom is an essential environment for this task, with teachers playing a main role in bolstering students' autonomy (Albari et al., 2013). The analysis of the relationship between PTAS and junior high-school students' creativity will not only compensate for the lack of related research in Chinese academia, but also provide empirical evidence of the vital role of teachers' autonomy support in the cultivation of students' creativity.

2. This study affords new empirical research evidence of the application of the self-determination theory, componential theory of creativity, and the ecological systems model of creativity in the field of education.

The research framework of this study was a combination of the self-determination theory, the componential theory of creativity and the ecological systems model of creativity. It was used to investigate the effect of environmental factors (e. g. perceived teachers' autonomy support) and individual factors (e. g., intrinsic motivation, cognitive flexibility) on junior high-school students' creativity.

On the one hand, the results confirmed the positive impact of intrinsic motivation and cognitive flexibility on students' creativity. This finding supports the influence of motivational factors and personal cognitive styles on creativity in the ecosystem model and Amabile's componential theory of creativity. On the other hand, it was found that PTAS has a positive impact on students' creativity, and IM and CF play a mediation role in the relationship between PTAS and creativity. The research conclusion provided strong support for the SDT's claim that meeting the need of autonomy can have a series of positive results. Furthermore, it was found that the ecosystem factor affects individuals' creativity directly and indirectly via the microsystem factor.

3. The results in this study furnish literary support for a comparison of the effect of PTAS on creativity between urban and rural schools.

The overall model was compared between rural and urban schools and it was found that the effect of urban students' perception of teachers' autonomy support on their intrinsic motivation was significantly greater than that of rural students. Based on the literature review, no researchers have ever compared the impact of teachers'

autonomy support on the creativity of different groups of Chinese students. Further research is needed to compare the impact of teachers' autonomy support on students' learning motivation among groups, regions or countries with diverse levels of economic development due to their various levels of school adaptation, learning investment, and mental health. An in-depth understanding of the impact of teachers' autonomy support on the creativity of students in urban and rural areas can be the basis of such future research.

6.1.2 Practical Significance of the Study

Firstly, this research provides some suggestions for teachers to cultivate the creativity of junior middle school students in the teaching process.The existing literature has confirmed that teachers' autonomy support can have many positive outcomes in education (Deci & Ryan, 2008; Paramitha & Indarti, 2014; Ryan & Deci, 2000a; Simon & Salanga, 2021; Whaley, 2012). It was confirmed in this study that perceived teachers' autonomy support could significantly predict the creativity of junior middle-school students. This validation provides enlightenment for cultivating junior middle-school students' creativity. The literature review has facilitated a more precise understanding of the definition of teachers' autonomous support, and enabled the provision of preliminary ideas and suggestions for the implementation of teachers' autonomous support in teaching practice. These ideas and suggestions to promote the cultivation of the creativity of junior middle-school students in Western China will be discussed in detail in the following content.

Secondly, the study emphasises on the critical role of motivational factors and cognitive styles in the practice of cultivating students' creativity. The influence of motivational factors and cognitive styles on creativity was outlined in the componential

theory of creativity. The mediating role of IM and CF between PTAS and students' creativity was further examined and the findings showed that an effect of mediating path is greater than that of the direct path in this study. This suggests that, in cultivating students' creativity, more attention should be paid to the individual factors that affect creativity, such as intrinsic motivation and cognitive flexibility. Environmental factors indirectly affect creativity via individual factors; therefore, promoting the level of their individual positive factors will enhance students' creativity.

Eventually, this study is conducive to implement differentiated measures in the cultivation of students' creativity between urban schools and rural schools. According to Amabile's componential theory of creativity, the environment also affects individuals' creativity. School is an important environmental factor for students, and one of a school's characteristics is its geographical location. In China, schools in urban areas are very different from those in rural areas. Therefore, the comparative analysis of urban and rural schools in this study facilitates a more accurate understanding of the different impact of perceived teachers' autonomy support on the creativity of students in different school environments. This can provide empirical support for proposing some effective measures to cultivate the creativity of students in urban and rural schools.

6.2 Recommendations for Educational Practice

It has been demonstrated in this research that perceived teachers' autonomy support, intrinsic motivation, and cognitive flexibility can accurately predict students' creativity. Hence, it can be concluded that the cultivation of students' creativity involves three aspects: enhancing students' perceived teacher autonomy support, intrinsic motivation, and cognitive flexibility. Specific suggestions are discussed in detail below.

6.2.1 Families and Schools Should Try Their Best to Meet Students' Basic Psychological Needs to Improve Their Intrinsic Motivation to Learn.

According to SDT, meeting individuals' innate psychological needs can enhance their intrinsic motivation. Proponents of this theory believe that the innate psychological needs for autonomy, relationships and competence are related to the deep structure of human psychology due to an inherent and lifelong aspiration to achieve effectiveness, connectedness and coherence. Relatedness is viewed as the desire to perceive connection with others and experience love and be loved by others. Autonomy means volition to do something. It is that individuals desire self-organization and freedom to behave according to a holistic sense of self. Competency refers to individuals' ability to perform a specific task and their desire to express and use their abilities (Ryan & Deci, 2002). Therefore, schools and families strive to meet junior middle-school students' basic needs of autonomy, relationship and competence in order to enhance their intrinsic motivation.

Firstly, parents and teachers should give as much appraisal and positive feedback as possible to junior middle-school students. Early studies have confirmed that positive feedback is conducive to improving IM compared with no feedback, while negative feedback may reduce IM compared with no feedback (Deci, 1971). These results were linked to the need for competence (Deci & Ryan, 1980).

Secondly, parents and teachers should provide children with higher autonomy support. On the one hand, they should give children freedom in every aspect of learning and daily life, such as choosing assignments, participation in teaching classroom and family decisions, and selection of members in cooperative learning. On the other hand, parents and teachers should ensure that students obtain an explicit

structure. Farkas and Grolnick (2010) assert that structure is involved in the guidelines of every activity or a study task, involving the procedure to initiate it, the best methods to conduct it, the desired results, and corrective information response during the task. Sierens et al. (2009) observe that autonomy support and structure are positively correlated, while Nunez and Leon (2015) view autonomy support as the most crucial prerequisite for boosting IM. Therefore, parents and teachers should pay the most significant attention to supporting children's autonomy in order to foster their intrinsic motivation.

Lastly, parents and teachers should provide emotional and material resources to meet children's need for relatedness so that they can understand the value of education and experience love and being loved, which is conducive to help-seeking and provides the children with warmth and a sense of belongingness. Teachers should show concern for students, which can help to establish a close relationship and enhance their mutual trust.

6.2.2 Families and Schools Should Strengthen the Cultivation of Students' Cognitive Flexibility to Enhance Their Creativity.

This research also discovered that CF positively affects students' creativity and partially mediates the relationship between IM and the creativity of junior high school students in China. When people face environmental changes, cognitive flexibility can promote the shift of individual thinking to generate innovative ideas and promote discovery (Barbey et al., 2013). The findings also implied that IM indirectly affects creativity more than the control sub-dimension when the alternative sub-dimension of cognitive flexibility partly mediates the association between them. The practical value of this discovery lies in that the key to the positive impact of IM on

creativity is an alternative sub-dimension of CF, which refers to the ability of individuals to recognize alternative explanations and develop pluralistic solutions in challenging circumstances (Dennis & Vander Wal, 2010). Individuals can rapidly restructure their knowledge with more cognitive alternatives and adjust their reactions to satisfy rapidly-changing environment needs. Therefore, educators, especially teachers and parents, should pay more attention to cognitive alternatives to enhance students' cognitive flexibility. For example, families and schools could increase students' cognitive alternatives by building an open-minded learning environment and culture and fostering students' ability to establish inclusive cognitive categories. Moreover, cultivating their divergent thinking also enhances their cognition.

6.2.3 Improve the Training of Rural School Teachers to Enhance Their Concept and Skills of Autonomy Support

In China's compulsory education stage, there is still a significant gap in the investment of educational resources between urban and rural areas, especially in terms of teachers. The study found that in China, the urban-rural structural imbalance in allocating primary and secondary school teachers' resources is mainly reflected in the differences in teachers' quality (Zhang, 2016; Ma, 2017). City teachers have higher education, a broader vision, and can obtain a broader range of information. Especially in international metropolises such as Beijing and Shanghai, teachers can contact international advanced educational ideas, theories, methods, and technologies and quickly apply them in practice. On the contrary, teachers' educational level is relatively low in rural schools, and their ideas tend to be conservative. The traditional exam-oriented teaching mode is more prevalent in rural schools than in urban. There are even signs that teachers are more likely to be strict, autocratic, and rigid in teaching and

emphasize rules and unity in China's rural schools. They rarely allow students to choose freely. Therefore, it is essential to strengthening the training of rural teachers. First of all, through training, we should change teachers' educational ideas and ensure that teachers form a correct understanding of autonomy support for students and recognize the importance of autonomy support to positive educational achievements. Secondly, training helps teachers master the skills of providing autonomy support for students. Research shows that although teachers can recognize the importance of autonomy support to students, they may lack the necessary skills to provide autonomy support for students (Wu, 2017), such as how to guide students in exploratory learning? For a task, when students do not know how to start, how-to guide students and provide students with necessary information resources? How to express the task structure and meaning clearly? Solving the problems above requires teachers to have higher teaching skills than only imparting knowledge under the traditional teaching model.

6.2.4 Promote the Flow of Teachers Between Urban and Rural Schools to Lessen the Gap between Urban and Rural Educational Quality

The gap between urban and rural education is an objective reality in China's compulsory education stage. China's official education organization is more efforts to bridge the education gap between urban and rural areas. Given the gap between urban and rural teachers, this study proposes establishing a teacher mobility mechanism between urban and rural schools to encourage teachers to flow freely between urban and rural schools. First, the government should improve the salary of rural teachers to bridge the salary gap between rural and urban teachers. This measure can attract more excellent teachers to work in rural schools. Secondly, the education department should establish a platform for learning, exchange, and job rotation between urban and rural

teachers. It is conducive to isolating teacher resources between urban and rural schools. Liu and Liu (2017) found that the role of government departments is ineffective in the flow of teachers between urban and rural areas. Therefore, the local education authorities should actively promote the flow of teachers between urban and rural schools. Finally, implement the identity of the "Contractor" of teachers and promote teachers' logical flow between urban and rural schools. As a "Contractor," employees and employers have equal legal status and no dependency relationship. However, there is no actual "contractor" relationship between teachers and the school where they work in China, and teachers are attached to their worked schools. The employer is the primary provider of teachers' social security. If teachers leave the original school, their social welfare will disappear with the flow of teachers. Therefore, breaking the dependency relationship and establishing an actual "contractor" relationship is the basis for promoting the free flow of teachers between urban and rural areas.

6.3 Recommendations for Theoretical Research

This study uses a one-way MANOVA to examine the influence of family SES on students' creativity, IM, CF, and PTAS. The implementation process operationalizes family SES into three sequential variables: father and mother's education and family income. The research conclusively demonstrates differences in students' creativity and CF between parental education and family income levels. Because family SES is a sequential variable, it cannot enter the SEM together with other variables to explore the impact of family SES, IM, CF, and PTAS on junior high school students' creativity. Reviewing the relevant literature found that some studies use Duncan socioeconomic index (SEI) to evaluate family SES (Yang et al., 2020). After

standardizing parental education, occupation, and family income, the SEI can be calculated using a series of procedures proposed by Heshmat et al. (2016). After using this method, family socioeconomic status can enter the structural equation model as a continuous table variable. Future research can use this method to evaluate family SES, which will help reveal more information on the relationship between family SES and students' creativity.

Moreover, the samples used in this study were nested in different teachers' classes in four schools. Hierarchical linear modeling (HLM) is a statistical analysis method that can be implemented with special statistical software, and it can control the nesting effect (Raudenbush & Bryk, 2002). When controlling for notedness, more variations can be discovered and estimated. Therefore, some scholars suggest that when there are multiple levels of nestedness, researchers can use HLM if they want to compare different schools in Educational Research (Trouilloud et al., 2006). This study is carried out under the condition that there is a dramatic difference in the distribution of urban and rural education resources in the stage of compulsory education in China and to compare the impact of PTAS on creativity between urban schools and rural schools. The samples used in this research also have nested relationships. Future research can apply HLM to nest participants into different teachers, classes, and schools during data collection so as to control the impact that teachers and classes may have on the relationship between PTAS and students' creativity.

6.4 Limitations of the Study and Suggestions for Theoretical Research

Every research may be limited, and this one is no exception. When applying

research conclusions in practice, special attention should be paid to research limitations to avoid improper application of research results. The limitations are discussed in detail below.

Firstly, since the participants in this study came from four schools in different cities of Shaanxi province in Western China, the geographical distribution of the sample was too limited compared to China's geographical space. This limits the generalisability of the findings in terms of cultivating the creativity of students in different regions with other cultures. Therefore, it is suggested that future researchers of students' creativity should consider expanding the geographical distribution of the participants or choose other regions of western China, such as Tibet, which has more distinctive regional and religious cultures than Shaanxi. The investigation of multicultural participants would be conducive to revealing more interesting facts.

Secondly, research data were obtained from a single source using the self-report format, which may lead to common method bias. However, the CFA was achieved to determine any possible common method bias questions, and the results showed that there were none. Nevertheless, although this method was also used to detect common method bias in some published studies (Astakhova et al., 2017; Bonner et al., 2017), the CFA cannot eliminate common method variance in nature. Future researchers are recommended to collect the data from multiple sources and use a multi-methods design; for instance, collecting data from the students and teachers or applying another method such as observation to prevent the participants from over-reporting or under-reporting their perception of their personal variables. However, the experimental method could not be used in this research due to the influence of COVID-19 and strict measures to prevent virus transmission in China. A mixed-method design may be useful

for future studies that are aimed to investigate the effect of teachers' autonomy support on some variables related to positive learning outcomes.

Thirdly, this was a cross-sectional study. Although it has been widely employed in previous research in the educational field, longitudinal research is more suitable for testing the causal relationship between variables, which may be conducive to revealing some novel findings. However, during the COVID-19 pandemic in China, a longitudinal research design may increase the uncertainty of collecting data. In addition, during the implementation of the strict epidemic prevention policy by the Chinese government, it is challenging to measure students from four cities in China using a longitudinal research design. The findings of this study using a cross-sectional study established the foundation for further study on creativity and identified the factors that have a beneficial and significant effect on the development of students' creativity. A longitudinal research design can be applied in future research to explore changes in the association between teachers' autonomy support and students' creativity over time.

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APPENDICE

Formal Questionnaire

Preamble:

Hello, everyone student. My name is Wang Ruini and I'm a doctoral student. I want to research how teachers' autonomy support, intrinsic motivation, and cognitive flexibility affect students' creativity. To complete this study, I need to investigate junior middle school students. You can voluntarily choose whether you want to participate in the survey. This survey is anonymous, and I promise to keep the personal information involved in the questionnaire confidential. The survey data will only be used for research. Please don't worry. Your teachers won't know the survey results. Please fill in according to your actual situation. Finally, thank you for your participation.

Part I: Demographic Information/Background

1. Age:_____
2. 2. School name: _____
3. Gender: A. Male B. Female
4. Grade: A. Seven B. Eight C. Nine
5. Family located A. Countryside B. City
6. How many children in your home? A. one B. two C. Three and more
7. Father's education
   A. Elementary school B. Junior high school C. High school
   D. Undergraduate E. Postgraduate
8. Mather's education
   A. Elementary school B. Junior high school C. High school
   D. Undergraduate E. Postgraduate
9. Family monthly income
   A. Less 2000 B. 2000-4000 C.4000-6000 D. 6000-8000 E. 8000-10000
   F. More 10000

Part II Learning Climate Questionnaire

This questionnaire contains items that are related to your experience with your teachers in this class. Teachers have different styles in dealing with students, and we would like to know more about how you have felt about your interaction with your teachers. Your responses are confidential. Please be honest and candid.

Items	1.Strongly disagree	2	3	4.Neutral	5	6	7.Strongly agree
PTAS1. I feel that my teachers provide me choices and options							
PTAS2. I feel understood by my teachers							
PTAS3. My teachers conveyed confidence in my ability to do well in the course							
PTAS4. My instructor encouraged me to ask questions.							
PTAS5. My instructor listens to how I would like to do things.							
PTAS6. My instructor tries to understand how I see things before suggesting a new way to do things.							
PTAS7. I feel that my instructor accepts me.							
PTAS8. My instructor answers my questions fully and carefully.							
PTAS9. I feel able to share my feelings with my instructor.							

Part III Intrinsic Motivation Inventory

The following description is about your feelings about learning. Please choose the option consistent with your feelings.

Items	1.Strongly disagree	2	3	4.Neutral	5	6	7.Strongly agree
IM1. I enjoyed studying very much.							
IM2. I'm happy when I am studying.							
IM3. I thought studying was a fun activity.							
IM4. Studying always keeps me focused.							
IM5. I would describe studying as very interesting.							
IM6. I thought studying was quite enjoyable.							

Part IV Cognitive Flexibility Inventory

Please use the scale below to indicate the extent to which you agree or disagree with the following statements.

Items	1.Strongly disagree	2	3	4.Neutral	5	6	7.Strongly agree
CFIN1. I am good at ‘‘sizing up’’ situations.							
CFIN2. I have a hard time making decisions when faced with difficult situation							
CFIN3. I consider multiple options before making a decision.							

Continued

Items	1.Strongly disagree	2	3	4.Neutral	5	6	7.Strongly agree
CFIN4. When I encounter difficult situations, I feel like I am losing control.							
CFIN5. I like to look at difficult situations from many different angles.							
CFIN6. I seek additional information not immediately available before attributing causes to behavior.							
CFIN7. When encountering difficult situations, I become so stressed that I can not think of a way to resolve the situation							
CFIN8. I try to think about things from another person's point view.							
CFIN9. I find it troublesome that there are so many different ways to deal with difficult situations.							
CFIN10. I am good at putting myself in others' shoes.							
CFIN11. When I encounter difficult situations, I just don't know what to do.							
CFIN12. It is important to look at difficult situations from many angles.							
CFIN13. When in difficult situations, I consider multiple options before deciding how to behave.							
CFIN14. I often look at a situation from different viewpoints.							

Continued

Items	1.Strongly disagree	2	3	4.Neutral	5	6	7.Strongly agree
CFIN16. I consider all the available facts and information when attributing causes to behavior.							
CFIN18. When I encounter difficult situations, I stop and try to think of several ways to resolve it.							
CFIN19. I can think of more than one way to resolve a difficult situation I'm confronted with.							
CFIN20. I consider multiple options before responding to difficult situations.							

Part V Creativity Scale

Please assess the degree to which you possessed the characteristics described in each question.

Items	1.not at all characteristic	2	3	4.Neutral	5	6	7.very characteristic
C1. Suggests new ways to achieve goals or objectives							
C2. Comes up with new and practical ideas to improve performance							
C3. Searches out new technologies, processes, techniques, and/or product ideas							
C4. Suggests new ways to increase quality							
C5. Is a good source of creative ideas							

Continued

Items	1.not at all characteristic	2	3	4.Neutral	5	6	7.very characteristic
C6. Is not afraid to take risks							
C7. Promotes and champions ideas to others							
C8. Exhibits creativity on the study when given the opportunity to							
C9. Develops adequate plans and schedules for the implementation of new ideas							
C10. Often has new and innovative ideas							
C11. Comes up with creative solutions to problems							
C12. Often has a fresh approach to problems							
C13. Suggests new ways of performing study tasks.							