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## Promoting Creativity in Vocational Education: The Role of Self-Efficacy, Cognitive Style, and Playful Motivation in Students' Innovation Skills Development in Shandong Vocational Colleges

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	<b>Abstract</b>
<p><b>Article History</b></p> <p><b>Article Submission</b> 22 May 2023</p> <p><b>Revised Submission</b> 26 June 2023</p> <p><b>Article Accepted</b> 31 July 2023</p>	<p>This study delves into the influential factors shaping students' innovation skills within Shandong Vocational Colleges, China. It focuses on academic self-efficacy, cognitive style, motivation for cooperative playful learning, and their interplay in fostering creativity within vocational education. Employing a quantitative research approach, data from vocational program students were gathered through self-report questionnaires. Path analysis was utilized to examine the direct connections between independent factors (academic self-efficacy, cognitive style, playful learning motivation) and the growth of innovative skills. Additionally, a mediation study explored the impact of encouraging creativity on these associations. Results highlighted the robust positive influence of academic self-efficacy on innovation skill development, indicating that higher self-efficacy correlates with greater innovative abilities. Cognitive style exhibited a nuanced impact: the knowing style hindered while the developing style enhanced innovative skills. Motivation for cooperative playful learning significantly bolstered innovation skill development, showcasing a link between playful learning inclination and heightened innovative talents. Notably, fostering creativity in vocational education significantly mediated these relationships, enhancing the positive effects of self-efficacy, creative style, and playful motivation while exacerbating the negative impact of the knowing style on innovative skills. The study underscores the importance of nurturing self-efficacy, promoting playful learning environments, and accommodating cognitive style preferences to enhance innovative skills in vocational education. It contributes valuable insights tailored to the Chinese educational context, offering practical implications for educational policies aiming to foster innovation in vocational settings.</p> <p><b>Keywords:</b> Academic Self-Efficacy; Motivation for Cooperative Playful Learning Strategies; Cognitive Style; Promoting Creativity in Vocational Education; Student's Innovation Skills Development</p>

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## Introduction

The importance of fostering innovative abilities among students enrolled in vocational education programs has been increasingly acknowledged in recent times (Burke & Larmar, 2021). According to Henriksen, Creely, Henderson, and Mishra (2021) and Li, Kim, and Palkar (2022), the capacity to engage in innovative thinking, produce original concepts, and implement them in pragmatic contexts is essential for individuals to succeed in the contemporary, dynamic, and cut-throat labor market. The acquisition of practical skills necessary for specific careers is a crucial function of vocational education (Yeap, Suhaimi, & Nasir, 2021; Zhang & bin Mohamad Haris, 2023). Hence, it is imperative to investigate the elements that contribute to the cultivation of inventive abilities in this academic setting (Thianthai & Sutamchai, 2022).

Numerous research studies have explored the correlation between individual and contextual factors and the acquisition of innovative skills among students (Albulescu, Labar, Manea, & Stan, 2023; Susilawati, Khaira, & Pratama, 2021). Academic self-efficacy has emerged as a significant factor that has attracted considerable attention (Mozahem, Boulad, & Ghanem, 2021; Zhang & bin Mohamad Haris, 2023). Concept of academic self-efficacy is usually pertains to an individual's conviction in their capability to effectively execute a given task or attain a specific objective (Eidhof & de Ruyter, 2022). Moreover, the past studies have indicated that increased self-efficacy levels are linked to improved innovative behaviors, problem-solving skills, and creative thinking (Karaoglan Yilmaz, 2022; Park, 2023). The examination of self-efficacy's function in the advancement of innovative abilities can provide significant perspectives on how vocational education initiatives can enhance students' assurance in creating and executing innovative concepts (Zhang, Yin, & Wang, 2023).

Furthermore, the development of innovative skills is influenced by cognitive style, which is another significant individual characteristic (Chen, Lai, Lai, & Su, 2022; Wang & Don, 2023). Cognitive style pertains to the favored method of an individual in terms of handling information processing, thought organization, and problem-solving endeavors (Akmam, Hidayat, Mufit, Jalinus, & Amran, 2022; Kamarulzaman, Oo, Jodi, Aziz, & Mahmood, 2021). Various cognitive styles, namely the knowing style, planning style, and creating style, are associated with unique cognitive processes and thinking patterns that can influence an individual's ability to produce inventive concepts (Marantika, 2021; V.Mygal, G. Mygal, & S. Mygal, 2022). The objective of this research is to investigate the correlation between cognitive styles and the enhancement of innovative skills (Mursid, Saragih, & Hartono, 2022). The study aims to provide insights into how vocational education can effectively nurture the innovative potential of students by accommodating their distinct thinking preferences.

Additionally, there has been an increasing interest in utilizing cooperative and playful learning promote creativity, exploration, and collaboration is a characteristic of playful learning (Al Mohtadi, Almazaydeh, Alelaimat, & Al Sou'b, 2023; Macdonald, Malone, & Firth, 2022). The utilization of playful learning strategies has been linked to heightened levels of creative thinking, idea generation, and innovation, as suggested by previous research conducted by Johnston, Wildy, and Shan. (2022) and Lee et al. (2023). The examination of the impact of playful motivation on the enhancement of innovative abilities in vocational education learners can offer valuable perspectives on the creation of interactive and captivating learning settings that foster originality and inventiveness (Palioura & Dimoulas, 2022).

Although there is a significant amount of research on the subject, there are still some areas that require further exploration regarding the determinants that impact the acquisition of innovative abilities among students in vocational education (Basilotta-Gómez-Pablos, Matarranz, Casado-Aranda, & Otto, 2022). Prior research has focused on investigating the distinct impacts of academic self-efficacy, cognitive style, and motivation for playful learning on innovation skills (Hammad, Graham, Dimitriadis, & Taylor, 2022). However, there exists a research gap that necessitates the examination of their collective and interdependent effects in the context of vocational education (Bükki & Fehérvári, 2021). According to Lee et al. (2023), a detailed comprehension of the interplay and impact of these variables can provide a more refined outlook on the complex mechanisms involved in fostering innovative abilities (H. Kim, So, & Park, 2022).

The investigation of the variables that impact the growth of innovative skills in Chinese

vocational education is essential in formulating efficient educational policies and practices that can adequately cultivate students' innovative capabilities in this particular cultural and educational milieu (Jiang, 2022; Wu & Liu, 2023). The purpose of this research is to fill the gaps in existing literature by examining the connections among academic self-efficacy, cognitive style, motivation for cooperative playful learning strategies, promoting creativity in vocational education, and the enhancement of students' innovative skills in Shandong Vocational Colleges located in China.

1. How does academic self-efficacy influence students' innovation skills development in Shandong Vocational Colleges?
2. What is the relationship between motivation for cooperative playful learning strategies and students' innovation skills development in the context of vocational education?
3. How do different cognitive styles, including knowing style, planning style, and creating style, impact students' innovation skills development in Shandong Vocational Colleges?
4. To what extent does promoting creativity in vocational education mediates the relationship between academic self-efficacy and students' innovation skills development?
5. How promoting creativity in vocational education does mediates the relationship between motivation for cooperative playful learning strategies and students' innovation skills development?
6. To what degree does promoting creativity in vocational education mediates the relationship between different cognitive styles (knowing style, planning style, and creating style) and students' innovation skills development in Shandong Vocational Colleges?

### Literature Review

The growth of creativity in vocational education has received substantial attention due to its influence on the development of students' inventive skills (Suryanto, Degeng, Djatmika, & Kuswandi, 2021). The interaction between academic self-efficacy, desire for cooperative fun learning practices, and cognitive style has been identified as key elements in boosting creativity inside vocational institutions in Shandong, China (Quadir, Mostafa, Yang, Shen, & Akter, 2023). Academic self-efficacy refers to students' views in their own academic ability, whereas motivation for cooperative playful learning techniques includes the intrinsic desire to engage in collaborative and fun learning activities (N. K. M. Isa, Nordin, Saari, N. J. M. Isa, & Yunus, 2023; Zou, Zhang, Xie, & Wang, 2021). Furthermore, cognitive style, which includes knowing style, planning style, and generating style, represents students' preferred ways of receiving and processing information (Alalouch, 2021). Understanding how these variables influence the development of creativity and innovation abilities is critical for improving vocational education procedures (Mutohhari, Sutiman, Nurtanto, Kholifah, & Samsudin, 2021; Nelmira, Efi, & Sandra, 2022).

Furthermore, the importance of developing creativity in vocational education serves as a mediates variable in this study (Bellibaş, Kılınc, & Polatcan, 2021). The efficacy of educational interventions and techniques targeted at encouraging creativity has a direct influence on the link between the aforementioned independent factors and the eventual outcome of students' innovation abilities development (Uus, Mettis, & Väljataga, 2022; Zhu, Liu, & Seong, 2023). By embracing project-based learning, interdisciplinary cooperation, hands-on experimentation, and fostering a supportive learning atmosphere, vocational institutions may foster students' creative thinking talents (Balleisen, Howes, & Wibbels, 2023). Recognizing and comprehending the significance of these factors can aid in the development of new and dynamic educational techniques that educate students for the changing needs of their occupational sectors in Shandong occupational Colleges, China (Cao, Ji, & Liu, 2023).

#### Academic Self-Efficacy

Academic self-efficacy is a person's confidence in their capacity to complete academic tasks and problems (Nurhikmah H, Febriati, & Ervianti, 2021). It has an important role on kids' academic performance and motivation (Yip, 2021). Academic self-efficacy is critical in molding students' innovative skills development in the context of boosting creativity in vocational education (Wu, Cassim, binti Masrul, & Kesa, 2021). Higher academic self-efficacy students are

more assured in their capacity to come up with innovative solutions to problems and to think creatively (Agustinova, Sutimin, & Purwanta, 2023; Green, 2022). This self-confidence inspires kids to take risks, try out novel methods, and persevere in the face of challenges, eventually fostering the growth of their unique skills (Zhang & Koshmanova, 2021). Understanding the link between academic self-efficacy and students' innovative talents in the context of vocational education is therefore critical for developing successful treatments and strategies (Preechawong Anmanatrakul, Pinit, Koul, & Easter, 2021).

#### Motivation for Cooperative Playful Learning Strategies

The natural desire and passion that students have while engaging in collaborative and fun learning activities is referred to as motivation for cooperative playful learning practices (Shin, 2022). It entails a desire to actively engage, investigate, experiment, and cooperate with peers in a supportive and playful setting (Laxton, Cooper, Shrestha, & Younie, 2021). This incentive is especially important in vocational education for the development of creativity and innovative abilities (Caves, Baumann, & Renold, 2021). The implementation of cooperative and enjoyable learning practices can enhance student motivation, leading to increased participation, idea exchange, and creative problem-solving (Aslan & Duruhan, 2021). The exchange of diverse perspectives and the emergence of novel ideas are fostered by the cooperative aspect of these undertakings, resulting in the cultivation of innovative thinking and aptitude for resolving issues (Martínez Casanovas, Ruíz-Munzón, & Buil-Fabregá, 2022). Recognizing the importance of motivation for cooperative fun learning tactics can assist educators and policymakers in developing engaging and interactive learning environments that enhance students' creativity abilities in vocational education (J. Kim, Lee, & Cho, 2022).

#### Cognitive Style

The preferred method of seeing, processing, and organizing information of an individual is referred to as cognitive style (Alalouch, 2021). Cognitive style is important in molding students' approaches to innovation and problem-solving in the context of encouraging creativity in vocational education (Meepung & Pratsr, 2022; Xing, Jamaludin, & Hamzah, 2023). It is made up of several sub-variables, such as knowing style, planning style, and creating style (Ain, 2021).

#### Knowing Style

This refers to how people seek and gain knowledge (Chang, Hwang, & Gau, 2022; Liu & Song, 2023). Some pupils like to learn through actual experiences, whilst others prefer abstract conceptualizations (Jensen, Bearman, & Boud, 2021). Knowledge students' knowing styles can help instructors customize instructional tactics to their preferred learning approaches, improving students' knowledge of creative concepts and encouraging creativity abilities (Ahmed & Mikail, 2022).

#### Planning Style

A person's method to arranging thoughts and actions is referred to as their planning style (Nilsook, Chatwattana, & Seechaliao, 2021). Some students like planned and systematic preparation, whilst others prefer a more flexible and spontaneous approach to planning (Yates, Starkey, Egerton, & Flueggen, 2021). Recognizing students' planning styles allows educators to give appropriate direction and assistance, ensuring that students in vocational education can effectively plan and execute innovative projects and activities (Guskey, 2021).

#### Creating Style

Creating style refers to how people produce and convey creative ideas (Hegazy & Elballah, 2023; Murzyn-Kupisz & Hołuj, 2021). Some pupils demonstrate exploratory and divergent thinking tendencies, whereas others exhibit convergent thinking patterns (Dumas, Dong, & Leveling, 2021). Recognizing students' creative types enables educators to design activities and assignments that stimulate and nurture their particular creative abilities, supporting the development of innovative skills in vocational education (Ismayilova & Bolander Laksov, 2023).

#### Promoting Creativity in Vocational Education

In this study, encouraging creativity in vocational education acts as a mediates variable. It includes the numerous educational techniques, interventions, and tactics used to improve

students' creative thinking and innovative abilities in the context of vocational education (Xie, 2021). Incorporating project-based learning, promoting multidisciplinary cooperation, giving chances for hands-on experimentation, and building a supportive and exciting learning environment are examples of such programs (Habib, Nagata, & Watanabe, 2021). The degree to which creativity is encouraged in vocational education programs and curricula influences the relationship between the independent variables (academic self-efficacy, motivation for cooperative playful learning strategies, and cognitive style) and the dependent variable (students' development of innovation skills) (Johari, Abdul Wahat, & Zaremohzzabieh, 2021; Liao, Chiang, Chen, & Parker, 2022). Understanding the function of encouraging creativity as a mediates variable can help educators and policymakers adopt successful methods to encouraging creativity and innovation in vocational education (Liu, Lu, & Yin, 2022).

#### Student's Innovation Skills Development

The development of students' innovation abilities relates to their capacity to produce new ideas, analyze critically, solve complicated issues, and implement innovative techniques within the context of vocational education (Mutohhari et al., 2021). It includes a variety of abilities like as creative thinking, problem solving, flexibility, teamwork, and effective communication (Wu & Liu, 2022). Students must learn these abilities in order to flourish in quickly changing work settings and contribute to the success of their chosen professions (Alemayehu, 2021). Educators and policymakers may create effective measures to support and foster students' innovation skills development by examining the elements that impact their growth, thereby preparing them for successful careers in their chosen domains (Kramarski & Heaysman, 2021).

In conclusion, this review of the literature gives an overview of the important factors and sub-variables involved in the study on increasing creativity in vocational education. Understanding the connections between academic self-efficacy, motivation for cooperative playful learning strategies, cognitive style (knowing style, planning style, and creating style), promoting creativity, and the development of students' innovation skills is critical for designing effective educational interventions and practices in the vocational education context (Irimiás, Mitev, & Volo, 2022). By investigating these elements, educators and policymakers may build settings that allow children to realize their creative potential and develop the critical innovative skills for future success.

#### Theory and Hypotheses Development

##### Social Cognitive Theory

The Social Cognitive Theory, formulated by Bandura (2023), offers valuable insights into understanding the relationships explored in this study. According to this theory, individuals' behaviors, beliefs, and outcomes are influenced by reciprocal interactions between personal factors, environmental factors, and behavioral factors (Bodhi, Singh, Joshi, & Sangroya, 2022). In the context of the study, the Social Cognitive Theory suggests that students' innovation skills development is influenced by personal factors such as academic self-efficacy and cognitive style, as well as environmental factors such as promoting creativity in vocational education (Liu et al., 2022). This theory emphasizes the importance of observational learning, self-efficacy beliefs, and environmental influences in shaping individuals' abilities, motivations, and behaviors, which are highly relevant to the hypotheses under investigation (Yin, Tam, & Lau, 2022).

##### Hypotheses Development

Based on the literature and theory review this study has found that, academic Self-Efficacy substantially affects the development of students' creativity skills. Moreover it also got supported by the concept of Social Cognitive Theory, which emphasizes the relevance of self-efficacy beliefs in molding individuals' skills and behaviors. Several research have shown that academic self-efficacy has a good influence on the development of creativity and innovative abilities (e.g., (Lin & Wang, 2021; Mashitoh, Sukestiyarno, & Wardono, 2021).

Moreover, this study has proposed that motivation for cooperative playful learning strategies significantly affects student's innovation skills development. Aligned with the Social Cognitive Theory, this hypothesis suggests that intrinsic motivation for cooperative and playful learning activities contributes to students' engagement and active participation, thereby enhancing their innovation skills. Research by Boysen, Sørensen, Jensen, Von Seelen, and Skovbjerg (2022) and

Khalil, Aljanazrah, Hamed, and Murtagh (2022) supports the positive relationship between motivation for playful learning and creativity.

In addition, this study has proposed that knowing style significantly affects Student's innovation skills development. The cognitive style of knowing refers to how individuals acquire knowledge, which can impact their ability to think creatively (Srikongchan, Kaewkuekool, & Mejaleurn, 2021). Research by Suryanto et al. (2021) and H. Kim, et al. (2022) suggests that individuals with diverse knowing styles bring different perspectives and approaches to creative problem-solving, thus influencing their innovation skills development.

This study has proposed that planning style significantly affects Student's innovation skills development. Bandura's Social Cognitive Theory recognizes the importance of individual preferences in planning and organization (Nwosu, Obidike, Ugwu, Udeze, & Okolie, 2022). Literature by Tarnanen, Kostiainen, Kaukonen, Martin, and Toikka (2021) and Zhang, Wong, and Wang (2022) supports the idea that individuals with different planning styles exhibit varied approaches to generating and executing innovative ideas, influencing their innovation skills development.

According to this study creating style significantly affects Student's innovation skills development. Similar to knowing and planning styles, creating style reflects individual preferences in generating and expressing creative ideas (Kumar, 2021). Research by Wildy and Shan (2022) suggests that individuals with different creating styles contribute diverse perspectives and approaches to creative problem-solving, thereby impacting their innovation skills development (Al-Husseini, El Beltagi, & Moizer, 2021).

Furthermore, promoting creativity in vocational education significantly mediates the relationship between the independent variables and student's innovation skills development (Demir, 2021). The Social Cognitive Theory emphasizes the influence of environmental factors on individuals' abilities and behaviors (Radhamani, Kumar, Nizar, Achuthan, Nair, & Diwakar, 2021). Research by Conradty and Bogner (2022) and Anselmus Dami, Budi Wiyono, Imron, Burhanuddin, Supriyanto, and Daliman (2022) supports the notion that interventions and strategies aimed at promoting creativity in vocational education create a supportive learning environment that enhances the relationships between academic self-efficacy, motivation for cooperative playful learning strategies, cognitive styles, and students' innovation skills development.

By drawing upon the Social Cognitive Theory and aligning with existing literature, the hypotheses in this study provide a solid theoretical justification for investigating the relationships between the variables and their implications for promoting innovation skills in vocational education (Figure 1).

H1: Academic self-efficacy significantly affects student's innovation skills development.

H2: Motivation for cooperative playful learning strategies significantly affects student's innovation skills development.

H3: Knowing style significantly affects student's innovation skills development.

H4: Planning style significantly affects student's innovation skills development.

H5: Creating style significantly affects student's innovation skills development.

H6: Promoting creativity in vocational education significantly mediates the relationship of academic self-efficacy significantly and student's innovation skills development.

H7: Promoting creativity in vocational education significantly mediates the relationship of motivation for cooperative playful learning strategies significantly and student's innovation skills development.

H8: Promoting creativity in vocational education significantly mediates the relationship of knowing style significantly and student's innovation skills development.

H9: Promoting creativity in vocational education significantly mediates the relationship of planning style significantly and student's innovation skills development.

H10: Promoting creativity in vocational education significantly mediates the relationship of

creating style significantly and student’s innovation skills development.

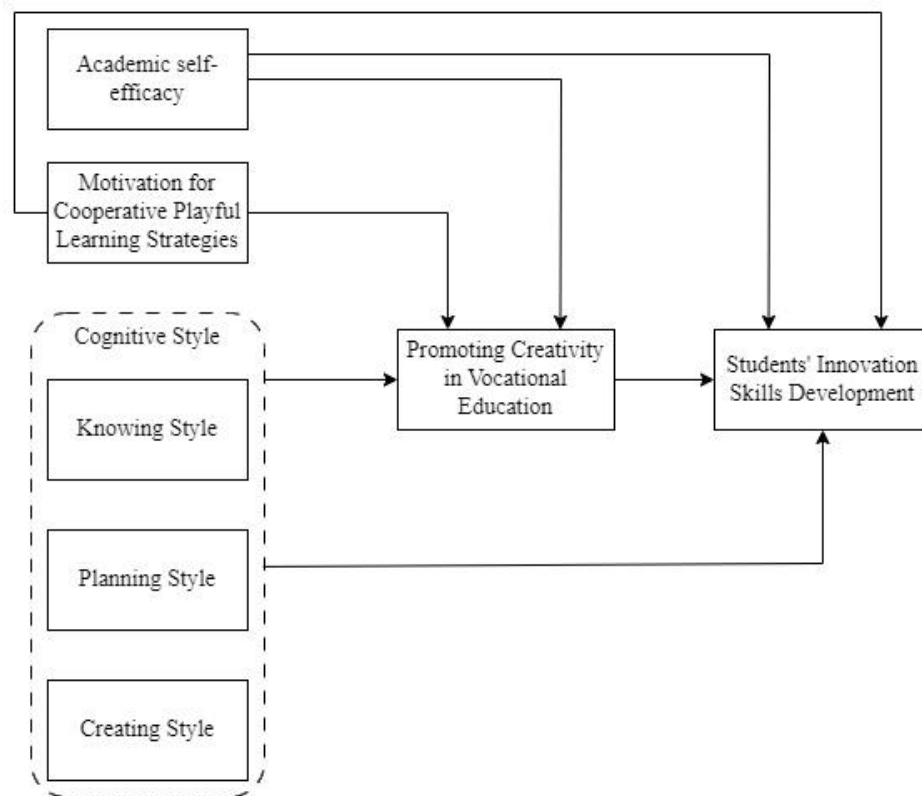


Figure 1. Conceptual model

### Methodology

This study gathered information from 287 students enrolled in eight Shandong Vocational Colleges by employing convenience-sampling method. This study used the STATA-16 software and the Structural Equation Modeling (SEM) method for the data analysis, which made it possible to look at complex correlations among variables.

Several scales from previous research papers were used to measure distinct constructs. The 16-item skills development measure was developed from a study conducted by Christensen and Knezek (2022). The 16-item scale for fun motivation was adapted from study conducted by Manzano-León et al. (2021). The 20-item scale for boosting creativity was developed from a study conducted by Oviawe (2010). Similarly, the 18-items cognitive style scale was adapted from the research of by Cools, Broeck, and Bouckennooghe (2006). Finally, eight items scale of self-efficacy was adopted from the study conducted by Hayat, Shateri, Amini, and Shokrpour (2020).

The research study attempted to ensure the validity and reliability of the data acquired by using these recognized measures. The incorporation of these measures from earlier studies allowed for a thorough assessment of the constructs under consideration. The data acquired using the appropriate scales was then analyzed using the STATA-16 program, which used the SEM approach to give a robust way for investigating the correlations between the variables of interest in a systematic and rigorous manner.

Overall, the researchers were able to collect relevant data from a sample of students, analyze the data using advanced statistical techniques, and draw meaningful conclusions about the relationships between skill development, playful motivation, promoting creativity, cognitive style, and self-efficacy. The inclusion of established scales from earlier research investigations verified the measurements' trustworthiness. The findings of this study have the potential to add to the current body of knowledge and inform future research in the subject of skill development and creative motivation among vocational college students.



## Results

Cronbach's alpha coefficients were used to examine the reliability of the measuring scales (Shakibazadeh, Sabouri, Mohebbi, Tol, & Yaseri, 2021) employed in this investigation (Table 1). The results show that the scales had good internal consistency. The Cronbach's alpha coefficient for the Creating Style scale was 0.849, indicating a good level of reliability. Similarly, the Cronbach's alpha coefficient for the Innovation Skills Development scale was 0.923, indicating a good degree of internal consistency. With a Cronbach's alpha coefficient of 0.786, the Knowing Style scale indicated adequate reliability, but the Planning Style scale gave a Cronbach's alpha coefficient of 0.821, indicating a reliable measure. The internal consistency of the variable Playful Motivation was found also significant, as its Cronbach's alpha coefficient was 0.873. The reliability of the Self-Efficacy scale was also found good; its Cronbach's alpha coefficient was 0.870.

The study's results indicate that the measurement scales employed are dependable and uniform in their capacity to apprehend the intended concepts. The strong Cronbach's alpha coefficients indicate that the items within each scale are highly correlated, indicating that the scales are internally consistent. As a result, the scales used in this study, namely Creating Style, Innovation Skills Development, Knowing Style, Planning Style, Playful Motivation, and Self-Efficacy, can be deemed valid measures for measuring the respective domains.

The proper capture and assessment of the many components under inquiry is dependent on the use of dependable measuring scales in this research project. The excellent internal consistency revealed in the Cronbach's alpha coefficients confirms the scales' reliability and increases the credibility of the study's conclusions. These dependable measures allow researchers and practitioners to confidently interpret and analyze data pertaining to Creating Style, Innovation Skills Development, Knowing Style, Planning Style, Playful Motivation, and Self-Efficacy, facilitating a comprehensive understanding of these constructs in the context of the study.

Table 1. Cronbach alpha statistics

	<b>Cronbach's Alpha</b>
Creating Style	0.849
Innovation Skills Development	0.923
Knowing Style	0.786
Planning Style	0.821
Playful Motivation	0.873
Self-Efficacy	0.870

In order to ascertain the accuracy and consistency of the measurement scales employed in this investigation, composite reliability (Lai, 2021) and average variance extracted (AVE) (Raza, Qazi, Khan, & Salam, 2021) were evaluated (Table 2). The study findings indicate that the scales demonstrate acceptable levels of both reliability and validity. The composite reliability of the Creating Style scale was found to be 0.885, with an AVE of 0.525. These results suggest that the scale exhibits strong internal consistency and convergent validity. The Innovation Skills Development scale demonstrated a considerable degree of reliability, as evidenced by a composite reliability score of 0.934 and an AVE value of 0.543. The reliability and validity of the Knowing Style scale were deemed satisfactory, with a composite reliability of 0.850 and an average variance extracted (AVE) of 0.656. The Planning Style scale exhibited satisfactory reliability with a composite reliability score of 0.870. The validity of the scale was moderate, as indicated by an average variance extracted (AVE) score of 0.532. The Playful Motivation scale demonstrated dependable measurements, exhibiting a composite reliability score of 0.893 and a satisfactory level of validity, as evidenced by an average variance extracted (AVE) score of 0.596. The Self-Efficacy scale demonstrated acceptable levels of reliability (composite reliability = 0.898) and convergent validity (AVE = 0.525).

Table 2. Validity and reliability confirmation

	<b>Composite Reliability</b>	<b>Average Variance Extracted</b>
Creating Style	0.885	0.525
Innovation Skills Development	0.934	0.543
Knowing Style	0.850	0.656
Planning Style	0.870	0.532
Playful Motivation	0.893	0.596
Self-Efficacy	0.898	0.525

The study's measurement scales have been validated and deemed reliable for evaluating the constructs of Creating Style, Innovation Skills Development, Knowing Style, Planning Style, Playful Motivation, and Self-Efficacy, as evidenced by these findings. The values of composite reliability signify the degree to which the items comprising each scale are reliably assessing the intended constructs. The scales demonstrate good internal consistency and are dependable for precise measurement, as indicated by the high composite reliability scores. The AVE scores signify the amount of variance encompassed by the scales, indicating convergent validity.

Ensuring the accuracy and robustness of a study's findings requires confirming the validity and reliability of the measurement scales used. The obtained outcomes instill trust in the utilized measuring tools, which empowers researchers to precisely evaluate and scrutinize the concepts being studied. The utilization of dependable and accurate scales in this investigation adds to the general quality and thoroughness of the research, augmenting the believability and dependability of the acquired outcomes (Figure 2).

The study employed confirmatory factor analysis (CFA) (Nurhayati, 2021) to investigate the factor loadings of the measurement items on their corresponding latent constructs (Table 3 and Figure 3). The factor loadings are indicative of the magnitude and orientation of the association between each measure and its corresponding construct. The study's findings demonstrate noteworthy factor loadings for the items, which provide evidence for the convergent validity of the measurement scales.

The Creating Style construct was found to have significant factor loadings across all items, with values ranging from 0.638 to 0.787. The findings indicate that the items adequately encompass the intended facets of Creating Style. The factor loadings for the Knowing Style items were found to be strong, with values ranging from 0.708 to 0.928. This suggests that there is a good alignment between the items and the construct.

The Planning Style construct was found to have moderate to high factor loadings, ranging from 0.523 to 0.824, indicating a strong association between the items and the construct. The items related to Playful Motivation demonstrated noteworthy factor loadings, which ranged from 0.552 to 0.765. This suggests that they possess the capability to accurately assess the construct.

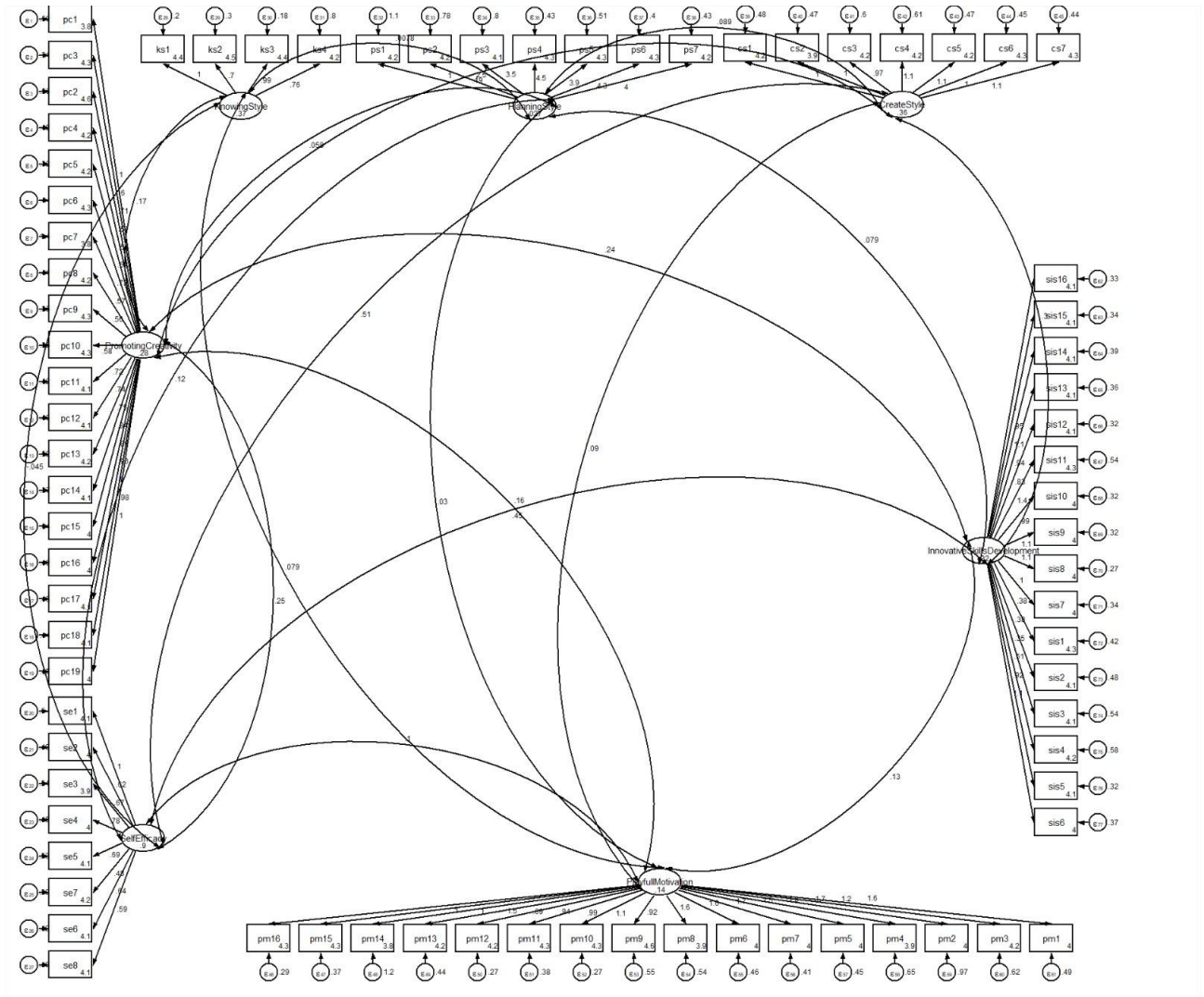


Figure 2. Measurement model analysis

The factor loadings of the items related to Self-Efficacy were found to be significant, with values ranging from 0.674 to 0.789. This provides evidence for the association between the items and the construct. The Innovation Skills Development items exhibited robust factor loadings, with values ranging from 0.687 to 0.790.

The reliable measurement of respective constructs is indicated by the significant factor loadings of the items; based on the evidence provided by the CFA results (Figure 3). The results of the study indicate that the measurement instruments utilized were appropriate and precise in measuring the intended latent variables. This has contributed to the validity and reliability of the study's outcomes.

Table 3. Confirmatory factor analysis

Variables	Items	Factor Loadings
Creating Style	CS1	0.725
	CS2	0.716
	CS3	0.638
	CS4	0.689
	CS5	0.742
	CS6	0.765
	CS7	0.787

<b>Variables</b>	<b>Items</b>	<b>Factor Loadings</b>
Knowing Style	KS1	0.708
	KS2	0.928
	KS3	0.778
Planning Style	PS2	0.523
	PS3	0.638
	PS4	0.824
	PS5	0.775
	PS6	0.806
	PS7	0.762
	Playful Motivation	PM1
PM2		0.605
PM3		0.552
PM4		0.658
PM5		0.707
PM6		0.745
PM7		0.765
PM8		0.693
PM10		0.592
PM11		0.475
PM12		0.519
PM13		0.508
PM14		0.538
Self-Efficacy		SE1
	SE2	0.696
	SE3	0.690
	SE4	0.764
	SE5	0.722
	SE6	0.758
	SE7	0.674
	SE8	0.694
Innovation Skills Development	SIS5	0.715
	SIS6	0.749
	SIS7	0.725
	SIS8	0.790
	SIS9	0.776
	SIS10	0.715
	SIS11	0.755
	SIS12	0.687
	SIS13	0.719
SIS14	0.734	
SIS15	0.731	
SIS16	0.737	

Coef.	OIM		P> z	[95% Conf. Interval]	
	Std. Err.	z			
var(e.pc1)	.5901885	.051564		.4973045	.7004209
var(e.pc3)	.3109617	.028077		.2605261	.3711611
var(e.pc2)	.5593506	.0495819		.4701452	.6654818
var(e.pc4)	.4177645	.0366672		.3517397	.4961826
var(e.pc5)	.3200088	.027865		.2698007	.3795604
var(e.pc6)	.3998871	.0350308		.3367988	.4747929
var(e.pc7)	1.352892	.1155022		1.144438	1.599314
var(e.pc8)	.4073353	.0363954		.3418985	.4852962
var(e.pc9)	.347895	.030749		.2925594	.413697
var(e.pc10)	.3458508	.0308102		.290442	.4118303
var(e.pc11)	.4221536	.0381674		.3536002	.5039977
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var(e.sis5)	.3190567	.0282107		.2682906	.379429
var(e.sis6)	.3675874	.0325189		.3090712	.4371826

Figure 3. Measurement items fitness statistics

The suggested model and the saturated model, as well as the baseline model and the saturated model (Savalei, Brace, & Fouladi, 2023), were both compared using the chi-square fit statistics (Table 4). These statistics show to what extent the suggested model matches the observed data. The likelihood ratio chi-square (2) value for the model comparison between the suggested model and the saturated model was 18,754.167 with 2,830 degrees of freedom. The estimated model chi-square values (p-value 0.001), demonstrates the significant difference between the suggested model and the saturated model. Therefore, the estimations shows that the saturated model developed in the study represents a perfect match and it provides a better fit to the data.

The likelihood ratio chi-square (2) value for the comparison of the baseline model with the saturated model was 26,475.977 with 2,926 degrees of freedom. This chi-square value's p-value was 0, demonstrating a substantial difference between the baseline model and the saturated model. This suggests that, in contrast to the saturated model, the baseline model, which represents the minimal fit, does not likewise provide a perfect match for the data.

Table 4. Chi-square fit statistics

Fit statistic	Value	Description
Likelihood ratio		
chi2_ms(2830)	18754.167	model vs. saturated
p > chi2	0.001	
chi2_bs(2926)	26475.977	baseline vs. saturated
p > chi2	0.001	

The adequacy of the model fit was evaluated by contrasting the estimated model with the saturated model, which denotes an ideal fit (Table 5). The study employed the Standardized Root Mean Square Residual (SRMR) (Pavlov, Maydeu-Olivares, & Shi, 2021) values as the fit statistics for comparison. The SRMR value of 0.068 for the saturated model suggests that the model fits the data exceptionally well. Conversely, the model that was approximated produced an SRMR score of 0.078, indicating a marginally greater degree of residual error or inadequate fitting when compared to the saturated model. The results suggest that although the model estimation shows a satisfactory match with the data, there is still scope for enhancing the fit by minimizing the residual error.

Table 5. Model goodness of fit statistics

	Saturated Model	Estimated Model
SRMR	0.068	0.078

The study employed F-square statistics (Fauzan, Triyono, Hardiyanta, Daryono, & Arifah, 2023) to evaluate the extent to which the independent variables accounted for the variance in the dependent variable, namely Innovation Skills Development (Table 6).

According to the findings, the extent to which Creating Style accounts for the variability in the development of Innovation Skills is approximately 9.7%. The variance explained by Knowing Style is limited to 1.7%, whereas Planning Style accounts for a more significant proportion of approximately 7.3%. The results indicate that Playful Motivation has a significant explanatory power, accounting for approximately 23.1% of the variance observed in the development of Innovation Skills. The study reveals that Self-Efficacy has the greatest influence, accounting for around 28.1% of the variability in the enhancement of Innovation Skills.

The results of the study indicate that the cultivation of Creating Style, Playful Motivation, and Self-Efficacy are significant elements that contribute to the enhancement of innovation skills. The variables of Knowing Style and Planning Style exhibit a comparatively less pronounced impact on the development of Innovation Skills as opposed to the remaining factors. It should be emphasized that although these variables make individual contributions to the variability in the development of innovation skills, there could be additional unaccounted factors that exert a substantial influence. To gain a comprehensive understanding of the intricate correlation between these

factors and the acquisition of innovative skills, additional investigation and examination are required.

Table 6. F-square statistics

	<b>Innovation Skills Development</b>
Creating Style	0.097
Knowing Style	0.017
Planning Style	0.073
Playful Motivation	0.231
Self-Efficacy	0.281

The R-square value was computed to assess the percentage of variability (Ozili, 2023) in the Innovation Skills Development, which can be accounted for by the predictor variables in the model (Table 7).

According to the results, the model's independent variables account for around 80.3% of the variability observed in the development of Innovation Skills. The findings indicate that the variables, including Creating Style, Knowing Style, Planning Style, Playful Motivation, and Self-Efficacy, exert a significant impact on the enhancement of innovation skills. The study's model has demonstrated effectiveness in explaining a substantial portion of the observed variability in Innovation Skills Development, as evidenced by the high R-square value. It is imperative to acknowledge that there could be additional variables beyond the model's scope that also play a role in fostering innovation competencies.

Possible rephrased text: Future investigations may aim to examine other variables or factors that could affect the development of Innovation Skills, and also scrutinize the particular associations and interplays among the independent variables identified and their effects on the dependent variable.

Table 7. R-square statistics

	<b>R - Square</b>
Innovation Skills Development	0.803

To investigate the links between the independent variables (Self-Efficacy, Knowing Style, Planning Style, Create Style, Playful Motivation) and the dependent variable (Innovative Skills Development), a direct route analysis was performed. Table 8 displays the coefficients, standard errors, z-values, p-values, and confidence ranges.

The findings of the analysis shows that Self-Efficacy has a significant impact on the development of Innovative Skills (coef. = 0.287, p 0.001). So it can be concluded that the people who have a better sense of self-efficacy are more likely to be creative in vocational learning settings. Moreover, the knowing style also has a substantial detrimental effect on the development of Innovative Skills (coef. = -0.315, p 0.001). This means that people with a higher proclivity for a knowing style may have lesser degrees of inventiveness.

The association between Planning Style and Innovative abilities Development was discovered to be non-significant (coef. = -0.065, p = 0.302), implying that planning style has no significant direct impact on innovative abilities. Create Style has a substantial positive effect on inventive abilities Development (coef. = 0.363, p 0.001), indicating that people who are more inclined to create style are more likely to display stronger inventive abilities. Finally, Playful Motivation has a substantial positive effect on Innovative Skills Development (coef. = 0.170, p = 0.007), indicating that those who are motivated by playfulness tend to be more innovative.

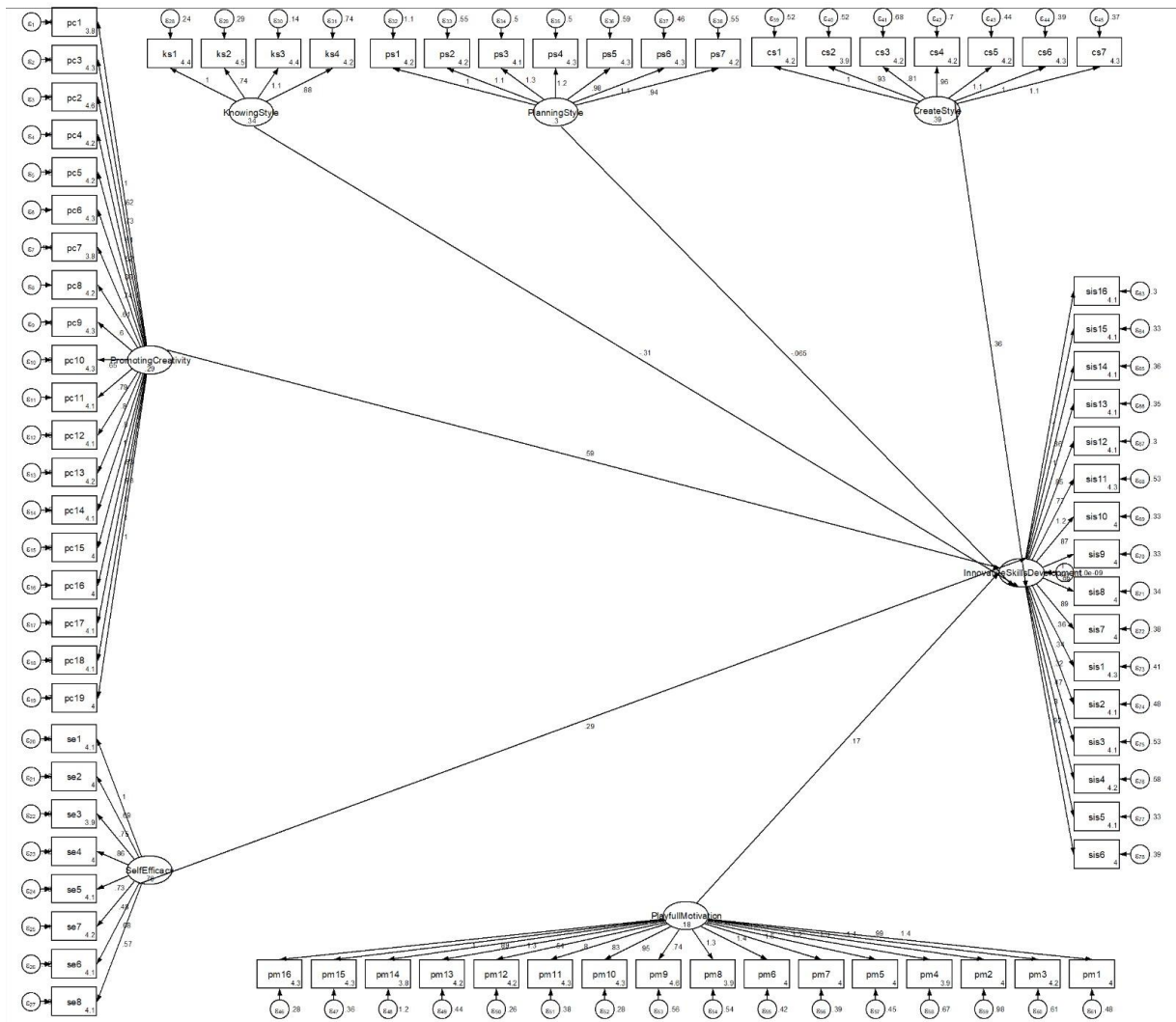


Figure 4. Structural model path analysis

Overall, these findings emphasize the importance of self-efficacy, style knowledge, style creation, and playful motivation in developing inventive talents (Figure 4). It is crucial to highlight, however, that the lack of a substantial association between planning style and inventive talents may signal the need for additional research or consideration of other aspects that may influence this relationship.

Table 8. Direct path analysis

	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
Structural Innovative Skills Development <- Promoting Creativity						
Self-Efficacy	0.287345	0.0477988	6.01	0	0.193661	0.381029
Knowing Style	-0.3145755	0.0481714	-6.53	0	-0.40899	-0.22016
Planning Style	-0.0647381	0.0627719	-1.03	0.302	-0.18777	0.058293
Create Style	0.3629713	0.0607469	5.98	0	0.24391	0.482033
Playful Motivation	0.1697948	0.0630489	2.69	0.007	0.046221	0.293368

The mediating path analysis was used to investigate the interactions between the independent factors (Self-Efficacy, Knowing Style, Planning Style, Create Style, Playful Motivation) and the mediator variable (Promoting Creativity) and the dependent variable (Innovative Skills



Development). Table 9 displays the coefficients, standard errors, z-values, p-values, and confidence ranges.

Moreover, findings of the analysis show that the interaction between Self-Efficacy and Promoting Creativity performs a substantial beneficial influence on the development of Innovative Skills (as evident by coef. = 0.417, p 0.001). This shows that when individuals are exposed to increasing levels of supporting creativity, the association between self-efficacy and the development of inventive talents is increased. Similarly, the interaction of Knowing Style and Promoting Creativity has a substantial negative effect on the development of Innovative Skills (coef. = -0.185, p 0.001). This means that the harmful influence of understanding style on the development of inventive talents is exacerbated when individuals are exposed to larger degrees of fostering creativity.

In the analysis the interaction among the Planning Style and fostering Creativity variables was also found significant (coef. = 0.065, p = 0.013). As the values are showing that the level of fostering creativity influences the association between planning style and innovative abilities development. It is crucial to note, however, that the effect size of this interaction is quite tiny. Create Style also has a positive association with Promoting Creativity (coef. = 0.723, p 0.001). This shows that when individuals are exposed to larger degrees of boosting creativity, the favorable association between producing style and the development of inventive talents is reinforced. Finally, the interaction of Playful Motivation and Promoting Creativity has a substantial favorable influence on the development of Innovative Skills (coef. = 0.300, p 0.001). This suggests that when individuals are exposed to increasing degrees of stimulating creativity, the association between fun motivation and the development of innovative talents is increased.

Overall, these findings show the significance of boosting creativity as a mediator in the relationship between self-efficacy, knowing style, planning style, creating style, playful motivation, and the development of inventive talents. The interactions show that encouraging creativity boosts the impacts of self-efficacy, creating style, and fun motivation on the development of inventive skills while amplifying the detrimental influence of knowing style. These findings shed light on the complicated interactions between individual features, contextual circumstances, and the development of inventive skills.

Table 9. Mediating path analysis

	<b>Coef.</b>	<b>Std. Err.</b>	<b>z</b>	<b>P&gt;z Std.</b>	<b>Coef.</b>
Innovative Skills Development <-					
Promoting Creativity	0.5930293	0.0915531	6.48	0	0.628876
Self-Efficacy	0.287345	0.0477988	6.01	0	0.496075
Knowing Style	-0.3145755	0.0481714	-6.53	0	-0.36221
Planning Style	-0.0647381	0.0627719	-1.03	0.302	-0.0707
Create Style	0.3629713	0.0607469	5.98	0	0.449638
Playful Motivation	0.1697948	0.0630489	2.69	0.007	0.141616

## Discussion

The current study sought to investigate the links between academic self-efficacy, motivation for cooperative playful learning strategies, cognitive style (including knowing style, planning style, and creating style), promoting creativity in vocational education, and the development of students' innovation skills in Shandong Vocational Colleges. The findings shed light on the importance of these variables and offer useful insights into their implications for boosting innovative talents among vocational college students.

Consistent with prior studies conducted by Park, Handley, Lang, and Erdman (2022) and Conradt and Bogner (2022), the results of this study highlights a robust correlation between variables academic self-efficacy and the promotion of students' creativity skills. The study's

findings suggest that individuals with greater levels of self-efficacy exhibit a higher propensity for innovation. The aforementioned statement highlights the significance of self-confidence in academic aptitude as a means of promoting ingenuity and originality. It is critical for vocational institutions to think about tactics that increase students' self-efficacy, such as providing constructive feedback, encouraging mastery experiences, and cultivating a supportive learning atmosphere.

In contrast, Qo'ldoshev (2021) and Maydiantoro et al. (2021) found that knowing style has a negative impact on the development of inventive talents. Individuals who displayed a larger proclivity for a knowing style may have struggled to generate unique and creative thoughts. These findings imply that encouraging creativity in vocational education is even more important for persons with a knowing style. Providing opportunities for alternative perspectives, encouraging inquiry and experimentation, and encouraging interdisciplinary collaborations may help reduce the negative influence of knowing style on the development of inventive talents.

Surprisingly, the association between planning style and the development of inventive talents was shown to be non-significant. This finding contradicts prior research, which found planning style to be a strong predictor of creativity (Cheng, 2021; Hosseini-Nasab, Saken Azari, & Tajadini, 2023). More research is needed to understand the underlying mechanisms and potential mediating factors that may influence the association between planning style and inventive talents. Other variables, such as contextual circumstances or task qualities, may interact with planning style to influence inventive outcomes. To acquire a more full knowledge of the link, future research should look deeper into these elements.

Our findings, on the other hand, indicated the favorable influence of establishing style on the development of students' innovation skills. This conclusion supports the research on creative problem-solving (Chen, Tsai, Liu, & Chang, 2021; Hsia, Lin, & Hwang, 2021). Individuals with a higher proclivity for generating style had superior inventive abilities. By providing possibilities for idea generation, divergent thinking, and creative expression, promoting creativity in vocational education can boost the favorable influence of generating style on the development of inventive talents. Encouraging students to consider many points of view, take risks, and embrace uncertainty can help to strengthen the link between creative style and inventive skills.

Furthermore, the strong favorable influence of playful motivation on the development of innovative skills is consistent with prior research by Vidergor (2021) and Canaslan-Akyar and Sevimli-Celik (2022). Individuals that were motivated by fun displayed greater degrees of inventiveness. Incorporating playful learning methodologies into vocational education can create an engaging and fun learning environment, resulting in enhanced intrinsic motivation and, as a result, improved inventive skills among students.

Furthermore, we investigated the mediating influence of encouraging creativity in vocational education. The findings suggested that encouraging creativity improved the positive association between self-efficacy and the development of creative abilities, as well as the positive relationships between creating style and fun motivation and the development of inventive skills. These findings highlight the importance of providing an educational atmosphere that fosters and supports innovation. Vocational colleges can significantly boost the impact of self-efficacy, creating style, and fun motivation on students' innovation skills development by embracing project-based learning, multidisciplinary partnerships, and supportive teaching techniques.

It is worth noting that the negative interaction between knowing style and boosting creativity exacerbated the detrimental influence of knowing style on the development of inventive talents. This emphasizes the importance of customized therapies that might address the specific issues that individuals with a knowing style confront. Individuals with a knowing style may benefit from systematic instruction, encouragement of investigation beyond traditional boundaries, and promotion of flexible thinking.

Finally, this study provides valuable insights into the relationships between academic self-efficacy, motivation for cooperative playful learning strategies, cognitive style, promoting creativity in vocational education, and the development of students' innovation skills in Shandong Vocational Colleges. The findings emphasize the significance of self-beliefs, cognitive styles, and environmental influences in the development of inventive skills. The findings of this study

emphasize the importance of encouraging creativity and implementing effective instructional strategies to develop creativity and innovation among vocational college students. Additional variables and situations should be investigated in future study to acquire a thorough knowledge of the complex dynamics involved in developing innovative capabilities in vocational education settings.

### **Conclusion**

The purpose of this study was to investigate the relationships between academic self-efficacy, motivation for cooperative playful learning strategies, cognitive style (knowing style, planning style, creating style), promoting creativity in vocational education, and the development of students' innovation skills in Shandong Vocational Colleges. The findings shed light on the elements that contribute to the development of innovative talents in vocational college students and have consequences for educational practices and interventions.

The findings of this study demonstrated the favorable impact of academic self-efficacy on the development of students' innovative skills. Individuals with higher degrees of self-efficacy demonstrated stronger inventive talents, highlighting the necessity of instilling confidence in pupils' academic abilities. This emphasizes the importance of educational institutions implementing tactics that boost students' self-efficacy, such as offering constructive feedback, encouraging mastery experiences, and fostering a supportive learning atmosphere.

Furthermore, the data indicated the impact of cognitive styles on the development of inventive talents. Individuals with a stronger proclivity for producing displayed higher levels of innovative skills, highlighting the importance of creative thinking and idea production in encouraging innovation. A knowing style, on the other hand, was connected with lower levels of inventive skills, indicating the difficulties faced by persons who prefer structured knowledge acquisition. Promoting creativity in vocational education is critical for limiting the detrimental influence of knowing style and encouraging students to think creatively.

The study also underlined the importance of motivation for cooperative fun learning practices in the development of students' creativity skills. Individuals who were motivated by playfulness had higher levels of innovation, highlighting the importance of engaging and pleasant learning experiences. Playful learning practices, such as gamification and project-based learning, can boost intrinsic motivation and stimulate the development of innovative abilities among vocational college students.

Furthermore, the study found that encouraging creativity in vocational education have a mediating influence. Promoting creativity enhanced the favorable benefits of self-efficacy, generating style, and fun motivation on the development of students' innovation skills. This emphasizes the necessity of providing an educational atmosphere that fosters creativity and allows students to engage in new techniques. Vocational colleges can successfully boost the impact of individual characteristics on the development of innovative talents by integrating creative teaching methodologies, multidisciplinary collaborations, and supportive learning settings.

Finally, this study adds to our understanding of the elements that influence the development of students' innovative skills in vocational education. The findings highlight the importance of academic self-efficacy, cognitive styles, motivation for cooperative playful learning practices, and stimulating creativity in the development of innovative talents among vocational college students. This study's implications extend to educational practices, emphasizing the need for interventions that boost self-efficacy attitudes, alleviate cognitive limitations, and foster creative and playful learning experiences. Future research should look into additional variables and contexts to better understand the difficulties of developing innovative capabilities in vocational college students.

### **Implications of the Research**

The study's results hold substantial theoretical and practical significance for the vocational education domain and the encouragement of innovative abilities in learners. This study adds to

the current literature and offers valuable insights for researchers and educators by analyzing the connections among academic self-efficacy, cognitive style, motivation for cooperative playful learning strategies, promoting creativity in vocational education, and the development of students' innovation skills.

#### Theoretical Implications

The present research adds to the social cognitive theory by furnishing empirical proof of the associations among self-efficacy, cognitive style, and the enhancement of innovation skills. Findings of this study got supported by the principles of social cognitive theory, as they suggest that individuals who possess elevated levels of self-efficacy are inclined to demonstrate superior innovative abilities. These finding provides evidence for the concept that one's self-beliefs are a critical factor in determining their capacity for creativity and innovation. The study's results provide insight into the impact of cognitive styles, indicating that those with a creating style exhibit greater proficiency in innovative abilities. The statement is consistent with the cognitive viewpoint on creativity, which highlights the significance of producing a variety of ideas and divergent thinking to promote inventive results.

#### Practical Implications

This study has two practical implications, namely instructional strategies and policy implications. The research findings can be useful for educators and vocational colleges to improve their instructional strategies. This can be achieved by incorporating methods that boost self-efficacy, encourage innovative thinking, and create a playful learning environment. Effective cultivation of innovative skills among vocational college students can be achieved through various strategies such as providing constructive feedback, encouraging mastery experiences, integrating playful learning activities, and promoting interdisciplinary collaborations. Educators can establish a conducive learning environment that fosters creativity and innovation by customizing instruction to cater to individual cognitive styles.

The policy implications for vocational education institutions can be inferred from the findings of this study. The prioritization of creativity promotion in vocational education is imperative in the development of curricula and educational policies. Integrating the promotion of creativity as a fundamental component of vocational education can equip learners with the essential competencies and perspective required to excel in a dynamic and inventive labor market. The process may entail providing instruction to instructors on how to incorporate innovative teaching methods, establishing collaborations with industry stakeholders to offer practical innovation opportunities, and generating avenues for students to participate in entrepreneurial endeavors.

In general, this study enhances the theoretical comprehension of social cognitive theory and offers practical applications for vocational education. The research highlights that developing innovative skills among vocational college students is contingent upon their self-beliefs, cognitive styles, motivation, and promotion of creativity. Through careful consideration of these implications, educators and policymakers have the ability to establish an educational environment that fosters and cultivates the creative potential of students, providing them with the essential abilities to succeed in progressive and ever-changing professional settings.

### **Limitations and Future Research Directions**

There are some limitations that should be acknowledged despite the fact that this study offers insightful information about the connections between academic self-efficacy, cognitive style, motivation for cooperative playful learning strategies, encouraging creativity in vocational education, and students' development of innovation skills. These restrictions draw attention to topics for future study as well as potential gaps in our knowledge of the complicated interactions that generate creative talents in vocational college students.

The use of self-report measures, which may include response bias and social desirability effects, is one of the study's limitations. To give a more thorough and objective evaluation of students' innovation talents, future study might include objective metrics like performance-based evaluations or observational methodologies. Furthermore, the research was restricted in its

generalizability by its emphasis on a particular sample and environment (Shandong Vocational Colleges). The robustness and transferability of the findings to other contexts would be established by having this research replicated in multiple student demographics and vocational education settings.

The study's cross-sectional design, which limits our ability to demonstrate causation and temporal correlations, is another drawback. It would be easier to comprehend the dynamic character of inventive talents and how the identified components change and interact with one another if longitudinal studies followed students' growth through time. Additionally, the research primarily focused on individual-level characteristics and did not investigate contextual or organizational elements that may have an impact on the development of innovation abilities. Future studies should look at how industry partnerships, curriculum design, and institutional support affect students at vocational colleges' ability to innovate.

Additionally, the research only looked at the direct and mediating impacts of the factors found on students' growth in innovative abilities. A more in-depth knowledge of the underlying mechanisms by which these variables impact inventive talents might be obtained by investigating possible mediators, such as creative thinking processes or problem-solving techniques. A more thorough knowledge of the cultural context's effect on the development of innovative abilities in vocational education might result from examining the impact of cultural elements on the connections found in this research.

Despite the fact that this study offers insightful information on the variables impacting students' acquisition of innovation abilities in vocational education, a number of its drawbacks call for more research. Future studies should think about how to overcome these constraints by using other approaches, including objective measurements, looking at contextual elements, applying longitudinal designs, looking at possible mediators, and taking cultural effects into account. Future studies may contribute to our understanding of this topic and provide a more nuanced view of how to encourage and promote the development of creative talents among vocational college students by filling in these gaps.

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