

*Full Length Research Paper*

# **A study on the development of creativity of teachers in Shaanxi Universities in China in the context of demographic variables**

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**This study was to explore the current state of creativity among university teachers in Shaanxi, China. The study was based on creativity systems theory and a questionnaire survey was conducted with a convenience sample of university teachers in Shaanxi Province. A total of 711 teachers from 30 universities were sampled to compare the effects of demographic variables such as gender, title, subject background, and creativity award experience on statistical differences in creativity, and SPSS was used to analyse the effects between teachers' cognitive needs and creativity in the university context. The results of the study revealed that there were significant differences between title, subject background, and creativity award experience on creativity and cognitive needs of university teachers in Shaanxi; and there was a positive and significant effect of cognitive needs of university teachers on creativity.**

**Key words:** Teacher creativity, need for cognition, Shaanxi University teachers.

## **INTRODUCTION**

In the field of education, teachers are considered to be an important pillar of any educational institution. Teachers play a vital role in ensuring the success and effectiveness of the education system (Zainal and Matore, 2019). Teacher creativity has long been recognised as an important factor in developing creative and innovative learners (Craft, 2015; Saibon et al., 2017; Doyle, 2019). With the growing recognition of the importance of knowledge creation and exploratory, utilisation learning, creativity in schools and teachers has become an important issue in improving the quality of education

(Da'as, 2021). As a result, the need for creative teachers has been a hot topic worldwide (Khodabandeh and Jamali, 2019).

Despite the importance of teachers' creativity to the quality of teaching and learning in our knowledge society, interest in creativity in education has increased. In practice, however, it remains elusive and is often reduced to an area separate from other educational goals (Spendlove, 2008). This is the result of barriers of varying nature that are complex and difficult for educators to address (Henriksen et al., 2017). At all levels of

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education, traditional teaching methods that retain the power of the teacher do not allow learners to be creative in their changing life rushes (Gaspar and Mabic, 2015).

For teachers, the school environment continues to become increasingly stressful with little to no effort aimed to direct alleviating the problem. High stress and negative experiences can reduce teachers' creative resources such as creative beliefs, influences, thinking and behaviour (Anderson, 2020). Further, two decades of classroom observation research illustrate how most school environments still lack the conditions that foster opportunities for creative growth (Katz-Buonincontro and Anderson, 2018; Pitts et al., 2018).

Therefore, the aim of this study is to better investigate the current situation of creativity among university teachers in Shaanxi universities and to identify the factors affecting creativity.

The systemic theory of creativity explains that creativity is the result of an interactive process between three elements: the individual, the field and the discipline, which, in the case of schooling, include factors such as the background, experience and experience of the individual teacher, and the type of school or subject department in the field, and that these environmental factors may generate creativity in their interaction with the individual teacher. For example, Khana and Kamranb (2021) found that teacher creativity differed by demographic variables such as gender, highest professional qualification, and subject of focus in the research area of creativity. Henriksen (2016) found that teacher creativity differed in terms of creativity award experience. Martinsen (1995) argues that particular experiences and messages contribute to creativity and may also hinder creativity development, with more creative expression due to experience, but may also be limited to past experiences and hinder originality. Scholars have found that creativity is complex and Thurlings et al. (2015) in their study suggested that the factors that influence teachers' creativity are demographic, personal and organizational factors. Zainal and Matore (2019) study identified a total of 46 factors that is; demographic, personal or individual and organizational that has an impact on teachers' creative behavior.

Therefore, this study sought to examine whether there were significant differences in the control variables on the creativity and cognitive demands of university teachers, using the background variables of teacher gender, title, discipline, and creativity award experience, which were considered as control variables. This is one of the motivations for this study.

Some researchers have found that individuals with high cognitive demands show higher levels of curiosity (Sadowski and Cogburn, 1997; Watt and Blanchard, 1994). Dollinger (2003) argues that individuals with higher cognitive demands are willing to invest more time and effort in dealing with complexity in order to cope with vaguely defined problems, and that creative ideas

generated by higher cognitive demand are likely to have a positive predictive effect on fluency and flexibility in dealing with divergent thinking tasks (Butler et al., 2003). Cognitive demand is a positive predictor of the quality of problem solutions, and originality (Medeiros et al., 2014). Wu and Wu (2017) found a positive relationship between cognitive demand and innovative behavior through a survey of 179 individuals. However, there are inconsistent findings in related studies. For example, when some researchers used an experimental research model to validate this, they found no correlation between the two (Hester et al., 2012; Mumford et al., 2012). "Tok (2010) mentioned that although prospective teachers were aware of the importance of thinking, their level of cognitive demand was low. Polat and Tmkaya (2010) found no significant relationship between prospective teachers' cognitive level demand and problem solving skills."

Creativity is the result of interaction between individuals and complex situations. This paper is based on the characteristics of teachers' cognitive needs. Although cognitive needs have attracted a lot of attention from scholars in psychology and many other fields, few people pay attention to the role of cognitive needs in the context of teacher training (Arpaci and Bardakci, 2015). Suer and Kinay's (2019) study also found that research based on the relationship between prospective teachers' individual creative states and their cognitive level needs has not been identified. From this perspective, this study sought to identify the relationship between teachers' creativity and their cognitive needs in Shaanxi universities and to examine the important role of teachers' cognitive factors in this interactive process. These insights could help shape new directions for future research and support teacher development (Anderson et al., 2021).

## LITERATURE REVIEW

### Creativity

While there are many different definitions of creativity (Craft, 2003), Runco (2007) argues that creativity is a unique human trait, which reflects our cognitive ability to adapt to changing circumstances and our ability to effectively combine and improve the ideas we are exposed to. Russ (2011) has also proved that creativity is a process of both cognitive thinking and emotional feeling. Wu et al. (2017) believes that creativity is people's ability to think, solve problems, and produce original products with social or personal value. This process involves the interaction between personal characteristics and background, so as to develop new thinking and obtain innovative results. Regier and Savic (2020) believe that creativity provides individuals with new solutions and products and brings new or unexpected results.

Puangrimaggalatung (2021) argues that creativity is the

product of an individual's interaction with his or her surroundings, an ability to create new combinations based on data, details or elements that already exist or have been established, namely all of one's life experience and knowledge.

In a sense, creativity is the application of imagination. Innovation is the practice of putting new ideas into practice; innovation is the application of creativity. This study therefore defines creativity as the practice of teachers putting new ideas into teaching and work in their teaching work.

### **Need for cognition**

Some studies believe that cognitive need is the intrinsic motivation for individuals to participate in and enjoy hard cognitive activities or information processing (Cacioppo et al., 1984; Petty et al., 2009). Borg (2006) defines teacher cognition as a network of beliefs, knowledge, and ideas about their profession. Dickhauser and Reinhard (2006) conclude that cognitive needs are important variables affecting motivational processes and should be included in models describing the relationship between self-concept and individual beliefs or behaviors. Suer and Kinay (2019) argue that cognitive need refers to stable intrinsic motivation that develops over time. Previous studies have shown that individuals with high cognitive needs tend to process information categorization more carefully (Cacioppo et al., 1983; Xiao et al., 2021), individuals with high cognitive needs tend to devote more efforts to applying logical thinking and critical thinking (Austin et al., 2016). People with high cognitive needs may enjoy solving challenging puzzles or problems, conducting research on topics of interest and thinking about their own ideas (Coutinho et al., 2005; Curseu, 2011; Steinhart and Wyer, 2009).

According to the aforementioned literature cognitive demand is one of the antecedents that induce creativity and is the predictive variable proposed in this study. Based on the above definition and connotation of cognitive demand, this study defines cognitive demand as the extent to which teachers prefer to engage in cognitive thinking during their teaching activities.

### **Relationship between control variables and teachers' creativity**

Thurlings et al. (2015) in their study suggested that the factors that influence teachers' creative behavior are demographic (gender, teacher age, school demographics, teaching experience, teacher qualification and student level), personal and organizational factors. The study by Khana and Kamranb (2021) investigated the creativity of 155 teacher-teachers in different regions of Pakistan, including 65 males and 90 females in the period, and

found statistically significant differences in attitudes towards creativity on demographic variables such as teacher gender, highest professional qualification, and subject of focus. It was found that there were significant differences in teachers' attitudes towards creativity in the specialist subjects taught. Teachers who taught drawing subjects such as art had higher attitudes towards creativity than other teachers. The study conducted by Akkanat and Gokdere (2015) found that 13 chemistry teachers had established good beliefs about creativity and creativity in relation to intelligence. Furthermore, the findings of Al-Nouh et al. (2014) show that English teachers have positive attitudes towards creative thinking and what are happening in the classroom. Studies by Rubenstein et al. (2018) and Snell (2013) all concluded that experienced teachers have higher levels of creativity and innovation than less experienced teachers. Bandura (1997) found that attributes of the work environment (e.g. rewards, support, warmth, recognition, etc.) perceived directly or indirectly by work members may also influence their motivation and behavior. Hoy and Miskel (2001) also concluded that rewards for past performance, personal life experiences and social influences contribute to the development of one's intrinsic motivation. According to Amabile (1983), creativity is enhanced if rewards are more intrinsically derivative or if individuals are primarily motivated by the work itself because it is fun, enjoyable or satisfying. Henriksen's (2016) survey study also found that the study participants were National Teacher of the Year finalists/awardees and were seen as representatives of teachers who were both effective and creative because they were original, innovative and valuable.

Based on the above analysis, this study proposes the hypothesis that:

H1.1. There is a significant difference in creativity by gender.

H1.2. There is a significant difference in creativity between different job titles.

H1.3. There is a significant difference in creativity between different disciplinary backgrounds.

H1.4. There is a significant difference in creativity between different creativity award experiences.

### **The relationship between control variables and teachers' cognitive needs**

Previous research has shown that Gencdogan (2001) found that in a study conducted with teacher candidates from different departments of the university, female participants had higher levels of cognitive demand than male participants.

Whereas the results of other scholarly studies found that the cognitive demand levels of their participants did not indicate a significant difference according to gender (Güngör et al., 2018; Demirta-Madran, 2012; Saracaloglu

and Cengel, 2013). In another study, Snell (2013) found that teachers' level of experience did not lead to differences in their perceptions.

Gencdogan (2001) found in his study that the level of cognitive needs varied by professional variables, with students in the Department of Counseling and Guidance having higher levels of cognitive needs than students in the Department of History. Güngör et al. (2018) found that participants' levels of cognitive needs showed significant differences based on departmental variables, with participants in the Department of Physical Education and the Department of Physical Education Teaching having significantly higher than participants from the Department of Sport Management and Coaching Education. Pascarella et al. (2013) argued that the reason for the positive indirect effects of the American Academy of Arts and Sciences on both dimensions of cognitive need is conveyed through comprehensive exposure to clear and structured classroom instruction and deep learning experiences for students. In addition, several scholars have argued that research on the relationship between psychological well-being and cognitive demand suggests a positive relationship between cognitive demand and well-being, life satisfaction and self-efficacy (Cavasoz and Campbell, 2008; Coutinho and Woolery, 2004), and that well-being can be derived from award-winning experiences. Therefore, this study inferred that the award-winning experience of creativity of university teachers in Shaanxi has an impact on cognitive demand. Based on the above analysis, this paper proposes the following hypothesis:

H1.5. There is a significant difference in the cognitive needs of teachers of different genders.

H1.6. That there is significant differences in the cognitive needs of teachers with different job titles.

H1.7. That there is significant differences in the cognitive needs of teachers with different subject backgrounds.

H1.8. Significant differences in the cognitive needs of teachers with different award-winning experience in creativity.

### **Cognitive demand and teacher creativity**

Cacioppo and Petty (1982) have described cognitive demand as an individual difference in the intrinsic motivation of individuals to engage in information and cognitive activities. People with high cognitive demands are more intrinsically motivated than those with low cognitive demands to engage in brainstorming activities (Cacioppo and Petty, 1982) and to engage in discussions about the quality of messages (Cacioppo et al., 1984), and in the process they also display deeper thinking and stronger attitudes and behaviours in relation to the messages (Cacioppo et al., 1986), and thereby enhancing creativity. Dollinger (2003) argues that, given the complex nature of creativity, individuals with higher cognitive

demands are willing to invest more time and effort in dealing with complexity in order to cope with ill-defined problems, and creative thinking is likely to become higher as a result. As cognitive demand increases, the tendency for individuals to think about many things, including their own ideas, increases (Petty et al., 2009). Cognitive demand is a positive predictor of the quality of problem solutions, and originality (Medeiros et al., 2014). Ideas generated by cognitive demand have a positive predictive effect on fluency and flexibility in responding to divergent thinking tasks (Butler et al., 2003).

Because individuals with high cognitive demands have higher levels of personality self-control (Bertrams and Dickhauser, 2009), tend to seek, acquire, think about and reflect on relevant information when solving cognitive tasks (Cacioppo and Petty, 1982; Cacioppo et al., 1996; Coutinho et al., 2005), invest more cognitive resources in information processing (Enge et al., 2008; Fleischhauer et al., 2010), have a more rational decision-making style (Curseu, 2006), are more likely to come up with good ideas and new thoughts, or have new ways of solving the problems they encounter, and show a higher level of Creativity. In addition, Fleischhauer et al. (2010) suggest that the motivation of individuals with high cognitive demands to actively explore their environment should provide more effective ways of coping with uncertainty and the demands of everyday life. The results of Sure and Kinay's (2019) study demonstrate that prospective teachers' cognitive demands are a significant predictor of their personal level of innovation and that there is a relationship between positive and moderate levels of cognitive demands and their personal innovation status were positively and moderately significantly related to each other. Teachers' qualities can generate cognitive flexibility, which in turn leads to creative behaviours, including innovative teaching (Baer, 2020). The results of Sürer and Kinay (2019) also showed a significant positive relationship between teachers' cognitive level needs and their individual innovation status, with teachers' cognitive level needs being a significant predictor of their individual innovation status. Therefore, Hypothesis 2 is proposed: Teachers' cognitive demands have a positive and significant effect on creativity.

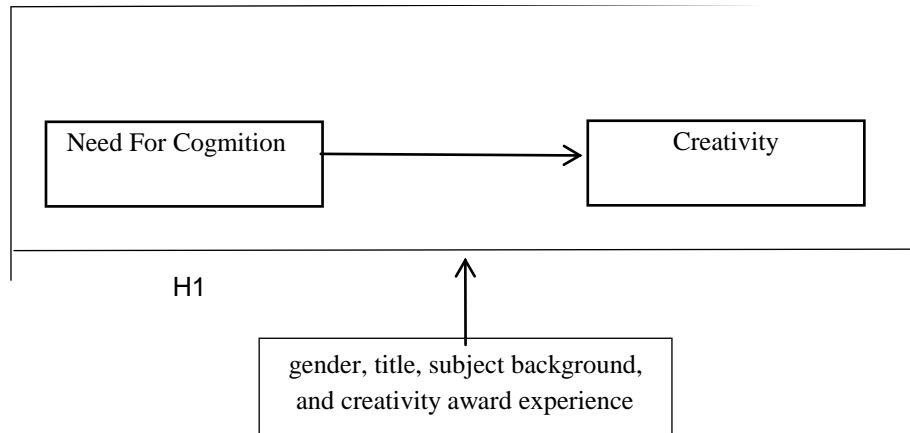
## **METHODOLOGY**

### **Research framework**

This study was to explore the impact of teachers' cognitive needs and creativity, and the differences in teachers' cognitive needs and creativity under demographic variables. The framework of the study is shown in Figure 1.

### **Subjects**

This study was conducted with university teachers in Shaanxi, China. One hundred and fifty pre-test questionnaires were



**Figure 1.** Research framework.  
Source: Author.

distributed and 131 valid samples were recovered, with an effective rate of 87.3%. The formal questionnaire was distributed to 900 teachers, a total of 30 questionnaires were distributed to 30 universities, 30 questionnaires were distributed to each university, and 711 valid samples were recovered, with an effective rate of 79%. The data collected was then statistically analyzed.

## Research tools

### Creativity scale

Teacher creativity is measured using the Creativity Scale developed by Zhou and George (2001). The scale has 13 items, such as "able to suggest new ways to achieve goals" and "proposes creative solutions to problems". The scale is scored on a 5-point Likert scale, with 1-5 indicating 'very unlikely to meet' to 'very likely to meet'. This scale has been used by scholars to measure teacher creativity (McCharen et al., 2011; Fidan and Oztürk., 2015; Makhrus et al., 2022). The internal consistency of the scale was 0.926, 0.952, and 0.937, respectively. This study created a Chinese version of the Creativity Scale using a reverse translation (Brislin, 1980), which had a Cronbach's alpha coefficient of 0.960. In addition, the corrected total item correlations, item deletions, Cronbach's alpha value, and the t-values for the items all met the criteria.

Formal scales were analyzed using validation factors in order to test for reliability, validity and goodness of fit. The factor loadings for the items ranged from 0.713 to 0.800, with a construct reliability (CR) value of 0.950, which exceeded the assessment criterion of 0.70. The average variance extracted (AVE) value of 0.594 exceeded the assessment criterion of 0.50 (Fornell and Larcker, 1981), indicating good reliability and validity. In terms of goodness of fit, CMIN/DF=5.738, RMSEA=0.082, RMR=0.016, SRMR=0.032, GFI=0.921, AGFI=0.890, NFI=0.943, CFI=0.953, RFI=0.932, IFI=0.953, PNFI=0.786, PGFI = 0.658 are all above the minimum recommended by scholars (Doll et al., 1994; Hair et al., 1998), indicating a good theoretical model fit.

### Need for cognition scale

Teachers' cognitive needs were measured using the Cognitive Needs Scale developed by Cacioppo and Petty (1984). The

scale has a total of 18 items and the sample question is "I prefer complex to simple problems". The scale is measured on a 5-point Likert scale, with 1 being strongly disagree and 5 being strongly agree, and was used by Suer and Kinay (2019) in their investigation of the relationship between prospective teachers' levels of cognitive demand and their state of personal innovativeness, which had a Cronbach's alpha coefficient of 0.79. This study A Chinese version of the Cognitive Needs Scale was created using a reverse translation (Brislin, 1980), which had an internal consistency coefficient of 0.884. A Chinese version of the Cognitive Demand Scale was created for this study using a reverse translation (Brislin, 1980), which had an internal consistency coefficient of 0.884. After item analysis of the scale, questions 6, 7, 12, 13, 16, 17 and 18 were removed based on three criteria: the corrected total item correlation, the Cronbach's alpha value after item deletion, and the t-value criterion for the items. All items met the criteria after the secondary item analysis.

The validation factor analysis formal scale was used to test its reliability, validity and fit. The factor loadings for the items ranged from 0.713 to 0.887, and the construct reliability (CR) values for "cognitive confidence" and "cognitive complexity" were 0.897 and 0.920 respectively, exceeding the assessment criterion of 0.70. The mean variance extracted (The mean variance extracted (AVE) values of 0.593 and 0.697 exceeded the assessment criterion of 0.50 (Fornell and Larcker, 1981), indicating good reliability and validity. In terms of goodness of fit, CMIN/DF=4.691, RMSEA=0.072, RMR=0.020, SRMR=0.040, GFI=0.952, AGFI=0.926, NFI=0.962, CFI=0.970, RFI=0.951, IFI=0.970, PNFI=0.752, PGFI = 0.620 are all above the minimum recommended by scholars (Hair et al., 1998), indicating a good theoretical model fit.

## RESULTS

### Descriptive statistics

A total of 900 questionnaires were sent out in this study, and a total of 711 valid questionnaires were obtained. Among them, 277 were male teachers and 434 were female teachers; in terms of titles, associate professors accounted for the most with 260 and lecturers the least with 98; in terms of years of teaching experience, 306

**Table 1.** Distribution of demographic variables for the positive test (N=711).

Demographic variable	Category	Number of people	(%)
Gender	Male	277	39.0
	Female	434	61.0
Title	Teaching Assistants	206	29.0
	Lecturer	98	13.8
	Associate Professor	260	36.6
	Professor	147	20.7
Discipline	Science and Engineering	49	6.9
	Management	92	12.9
	Social Sciences	114	16.0
	Economics	69	9.7
	Art	387	54.4
Creativity award-winning experience	No	223	31.4
	Provincial Awards	132	18.6
	National Awards	69	9.7
	Both	287	40.4

Source: Author collated from this study.

**Table 2.** Differences in teachers' creativity, cognitive needs by gender (N=711).

Variable	Gender	Number of people	Average	Standard deviation	t
Creativity	Male	277	4.068	0.540	1.139
	Female	434	4.117	0.585	
Need For Cognition	Male	277	4.300	0.519	1.129
	Female	434	4.345	0.519	

Source: Author

were the most with less than 5 years, 123 with 6-10 years, 224 with 11-20 years and 58 with more than 20 years; in terms of subject backgrounds, art accounted for the most with 387 and economics the least with 69; creativity awards In terms of experience, no award experience was the highest with 223, provincial awards were 132 and national awards 69, both of which were 287. Table 1 shows the distribution of demographic variables for the positive test.

### Difference analysis

#### ***Analysis of differences in creativity and cognitive needs by gender***

An independent sample t-test was conducted to test whether there were significant differences in creativity, cognitive needs between teachers of different gender

backgrounds. From the results of the analysis in Table 2, it was found that the different genders did not reach significance in creativity ( $t=1.139$ ,  $p > 0.05$ ) and cognitive needs ( $t=1.129$ ,  $p > 0.05$ ), therefore, there is no significant difference in creativity and cognitive needs between genders, therefore, H1.1 and H1.5 are not valid.

#### ***Analysis of differences in creativity, cognitive demand across background variables***

A one-way ANOVA was conducted to test the situation of differences in creativity and cognitive demand across job titles, subject backgrounds and experience of winning creativity awards. From the results of the analysis in Table 3, it was found that there were significant differences in creativity ( $F=5.372$ ,  $p < 0.01$ ) and cognitive demand ( $F=3.902$ ,  $p < 0.01$ ) between the different titles. A post-hoc comparative analysis by Scheffe's method

**Table 3.** Differences in teachers' creativity, cognitive needs across job titles (N=711).

Variable	Title	Number of people	Average	Standard deviation	F	Hindsight comparison
Creativity	Teaching assistants	206	4.032	0.630	5.372*	4>3
	Lecturer	98	4.148	0.613		
	Associate professor	260	4.027	0.425		
	Professor	147	4.230	0.593		
Need for cognition	Teaching assistants	206	4.289	0.593	3.902*	4>3
	Lecturer	98	4.386	0.549		
	Associate professor	260	4.257	0.406		
	Professor	147	4.420	0.552		

\*\* indicates  $p < 0.01$ . 1: Assistant Professor 2: Lecturer 3: Associate Professor 4: Professor.

Source: Author

**Table 4.** Differences in teachers' creativity, cognitive needs across subject backgrounds (N=711).

Variable	Discipline	Number of people	Average	Standard deviation	F	Hindsight comparison
Creativity	Science and engineering	49	4.165	0.506	14.523***	5>4
	Management	92	3.993	0.725		
	Social sciences	114	3.898	0.557		
	Economics	69	3.793	0.762		
	Art	387	4.208	0.424		
Need for cognition	Science and engineering	49	4.319	0.528	6.990***	5>4
	Management	92	4.291	0.631		
	Social sciences	114	4.188	0.519		
	Economics	69	4.116	0.698		
	Art	387	4.398	0.429		

\*\*\* indicates  $p < 0.001$ . 1: Science and Technology 2: Management 3: Social Sciences 4: Economics 5: Arts.

Source: Author

showed that professors were at a better level in terms of creativity and cognitive demand, and assistant professors were at a lower level in terms of creativity. Therefore, H1.2 and H1.6 hold.

From the results of the analysis in Table 4, it was found that there were significant differences in creativity ( $F=14.523^{***}$ ,  $p<0.001$ ) and cognitive needs ( $F=6.990^{***}$ ,  $p<0.001$ ) between disciplinary backgrounds. A post-hoc test by Scheffe's method showed that the arts category had an overall higher level of creativity and cognitive demand. Therefore, H1.3 and H1.7 hold.

From the results of the analysis in Table 5, it was found that there was a significant difference in creativity ( $F=3.761$ ,  $p<0.05$ ) and cognitive demand ( $F=2.860$ ,  $p<0.05$ ) for the creativity acquisition experience. A post-hoc test by Scheffe's method showed that both the provincial and national award experience had higher levels of creativity and cognitive demand overall. Therefore, H1.4 and H1.8 hold.

### Correlation analysis and differential validity

The Pearson correlation coefficient analysis revealed that there was a positive correlation between creativity and cognitive confidence of Shaanxi university teachers ( $r=0.744$ ,  $p<0.001$ ); a positive correlation between creativity and cognitive complexity of Shaanxi university teachers ( $r=0.437$ ,  $p<0.001$ ); and the correlations between all variables or constructs reached significance ( $p<0.001$ ). In addition, none of the correlation coefficients between the variables were greater than 0.8, indicating that there was no co-linearity. This also indicates that there is a correlation between the variables and that further regression analysis can be performed to test the causal relationship between the variables.

The means of the teacher creativity ( $M=4.087$ ,  $SD=0.558$ ) and cognitive demand constructs were ( $M=4.339$ ,  $SD=0.556$ ) ( $M=4.292$ ,  $SD=0.618$ ), respectively. The overall situation of teachers' creativity and cognitive

**Table 5.** Differences in teachers' creativity, cognitive demands on the experience of acquiring creativity (N=711).

Variable	Creativity award-winning experience	Number of people	Average	Standard deviation	F	Hindsight comparison
Creativity	No	223	4.000	0.650	3.761*	4>1
	Provincial Awards	132	4.080	0.549		
	National Awards	69	4.066	0.594		
	Both	287	4.164	0.459		
Need for cognition	No	223	4.248	0.578	2.860*	4>1
	Provincial Awards	132	4.320	0.513		
	National Awards	69	4.282	0.585		
	Both	287	4.380	0.447		

\* indicates  $p < 0.05$ . 1. None 2. Provincial awards. 3. National awards 4. Both.

Source: Author

needs are above the median of the five-point scale 3, thus indicating that the creativity and cognitive needs of teachers in Shaanxi universities are at a moderate to high level. Fornell and Larcker (1981) suggest that the number of AVE square roots for each construct that is greater than the number of correlation coefficients for each construct must be at least 75% of the overall number of comparisons. From the results data in Table 6, it appears that the square root of the AVE of each construct in this study is greater than the standardised correlation coefficient outside the diagonal, and therefore the model has good discriminant validity between the study constructs.

### Regression analysis

In this study, the demographic variables of title (based on professors), disciplinary background (based on arts), and creativity award experience (based on both awards) were included in the first tier; the cognitive demand variable was included

in the second tier, and the independent variables were entered into the model as Enter in each step. As can be seen from Table 7, model one has an adjusted  $R^2$  of 0.099 and an overall explanation of 9.9%, while model two shows that cognitive demand is a significant positive predictor of creativity, controlling for the background variable ( $\beta = 0.628$ ,  $t = 22.211$ ,  $p = 0.000$ ), with an adjusted  $R^2$  of 0.471 and an overall explanation of 47.1%.

### DISCUSSION

The results show that the genders did not reach significant differences in terms of teachers' creativity and cognitive needs. In terms of creativity, this is inconsistent with past research. For example, Al-Nouh et al. (2014) found that teachers showed high attitudes towards creativity. There were more talented men than women in creative tasks in science, art, literature, music and technological development (Eysenck, 1995; Reiss, 1999), while women contributed more than

men in writing, dance or drama (Baer, 2005; Eysenck, 1995). In relation to the current situation of creativity among university teachers in Shaanxi in this study, we analyse the reasons for this. In terms of creativity, the number of female teachers in the study is higher, with the majority being under 30 and 30-40 years old, which may be related to the fact that they have a lot of family and work commitments and fail to show creativity; in terms of cognitive demand, the results of this study are not consistent with the results of Curşeu's (2011) study. It concluded that there is a slight interaction between cognitive demand and gender, and that cognitive demand positively affects women more than men. Therefore, hypotheses H1.1 and H1.5 are not valid.

The different job titles reached significant differences in creativity, cognitive needs. This is in line with Khana and Kamranb's (2021) study which found statistically significant differences in teachers' creativity highest professional qualification (different job titles) background variables on attitudes towards creativity and Henriksen's (2016) findings that National Teacher



**Table 6.** Correlation analysis and differential validity of teachers' creativity, cognitive demand (N=711).

Variable	Creativity	Cognitive confidence	Cognitive complexity
Creativity	0.771		
Cognitive confidence	0.744***	0.770	
Cognitive complexity	0.437***	0.581***	0.835
Average	4.087	4.339	4.292
Standard deviation	0.558	0.556	0.618

\*\*\* indicates  $p < 0.001$ . Diagonal values are square roots of AVE.

Source: Collated from this study.

**Table 7.** Regression analysis of teacher background variables, cognitive demand on creativity (N=711).

Parameter	Creativity			
	Model 1		Model 2	
	$\beta$	t	$\beta$	t
Teaching assistants	-0.071	-1.368	-0.051	-1.265
Lecturer	0.015	0.341	-0.006	-0.174
Associate professor	-0.170	-3.578***	-0.076	-2.072*
Science and engineering	-0.023	-0.619	0.004	0.128
Management	-0.132	-3.522***	-0.086	-2.990**
Social sciences	-0.198	-5.309***	-1.108	-3.746***
Economics	-0.219	-5.923***	-1.118	-4.128***
No	-0.154	-3.294**	-0.057	-1.573
Provincial awards	-0.089	-2.060*	-0.038	-1.133
National Awards	-0.054	-1.406	-0.013	-0.457
Need for cognition			0.628	22.211***
R <sup>2</sup>	0.112		0.479	
After adjustment R <sup>2</sup>	0.099		0.471	
F-value	8.799***		58.475***	

\*\*\* indicates  $p < 0.001$ , \*\* indicates  $p < 0.01$ , \* indicates  $p < 0.05$ .

Source: Author.

of the Year finalist/award winner teachers are creative. There were also significant differences with cognitive demand in terms of job title (Gencdogan, 2001; Pascarella et al., 2013). Professorial titles had better levels of creativity and cognitive demand than other titles; title assistant teachers were at a lower level of creativity. The professorial title, however, has relatively longer work and seniority, and relatively more experience, and is a little more sensitive and insightful in terms of innovative change in schools. Teachers with more than 20 years of teaching experience score higher on average. Therefore, H1.2 and H1.6 hold.

The different subject backgrounds reached significant differences in creativity, and cognitive demand. This is in line with the study's finding of statistically significant differences in creativity (Khana and Kamranb, 2021) for the teacher-focused subject background variable, and in cognitive demand (Pascarella et al., 2013) and cognitive demand for the teacher's professional background. The

arts category had the highest levels of creativity and cognitive demand overall; the management category was at a lower level in terms of creativity. The distribution of the number of female teachers and the two background items in the arts category was relatively high among the subjects of this study. Therefore, H1.3 and H1.7 hold.

Creativity acquisition experiences reached significant differences in creativity, cognitive demand. This is in line with the findings of Henriksen (2016) and Cavasoz and Campbell (2008). The situation of receiving both provincial awards and national awards experience was overall higher in levels of creativity, cognitive demand, and climate of innovation, and the mean of none was higher, but both were lower than the three situations of provincial awards, national awards and both. The largest number of respondents to this study was under the age of 30, at 365, accounting for 51.3% of the sample. The probable reason for this is that younger teachers did not get a place in the awards when they participated less

frequently in competitions and had less experience. Therefore, H1.4 and H1.8 hold true.

The significant differences produced by the control variables on the variables in this study may be attributed to the personality, teaching experience and years of experience, professional background and award-winning experience of university teachers in Shaanxi. Therefore, the differences caused by the control variables should be considered in the development of creativity among university teachers, which is more conducive to the development and improvement of university teachers' creativity.

The study found that the effect of teachers' cognitive needs on creativity was statistically significant, indicating that teachers' cognitive needs positively influenced their creativity, meaning that teachers with higher cognitive needs would have higher creative performance. This result is in line with Bandura's (2001) social cognitive theory and self-efficacy theory, as higher individual teachers' cognition is more likely to lead to more effective work and further increase teachers' creativity. Therefore, H2 holds true.

## Conclusion

In this study, demographic variables included gender, job title, discipline and creativity award experience. After the empirical study, it was found that university teachers' titles and disciplinary backgrounds had significant differences on teachers' creativity and cognitive needs, respectively; university teachers' gender had significant differences on perceived organizational innovation climate; and university teachers' creativity award experience had significant differences on teachers' creativity and cognitive needs, respectively. This suggests that the contextual variables are also partially important factors in promoting creativity among university teachers in Shaanxi. Analysis of the differences brought about by the control variables can help to better develop strategies for the cultivation and development of college teachers' creativity.

The results of the study showed that the cognitive demands of Shaanxi university teachers had a significant positive effect on creativity. Teachers in Shaanxi universities are said to enjoy the responsibility of tackling problems that require a great deal of thought and enjoy completing a task that introduces a new approach to problem solving. They are willing to think abstractly about problems, to find good sources of ideas to come up with new ways to improve teaching and learning, and to derive satisfaction from long hours of difficult thinking, as well as to show creativity in their work. The influence of cognitive needs on the creativity of university teachers at the teacher level should therefore be taken into account. At the individual teacher level, the impact of teachers' cognitive needs is most evident, so two aspects of improving the initiative of Shaanxi university teachers and

constantly improving the keen creative insight of Shaanxi university teachers are considered for improving teachers' cognitive needs.

## Recommendations

The research shortcomings of this paper are mainly in the following two areas. The context of this study is universities in Shaanxi Province, China, and the research method only uses questionnaires. Due to the constraints of time, energy, economic conditions and many other factors, the selected questionnaire survey samples are mainly from 30 universities in Shaanxi Province. The samples from the eastern regions and economically developed regions were not surveyed. Therefore, the sample data obtained is not comprehensive enough, which will also affect the general applicability of the results of this study.

Although most of the scales used in this study are based on more mature research findings in the field from abroad and are widely used, there is a certain relevance to the study of university teachers in Shaanxi, China. Subsequent development of scales for individual university teachers' creativity in the Chinese context could be considered.

In today's fast-paced world of education and educational reform, enhancing teacher creativity is a key issue in order for education to remain relevant in achieving its goals. Future research could also consider the creativity of individual teachers in higher education under other contextual variables and other factors that influence teacher creativity.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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