



Research Article

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An Empirical Study on the Creative Learning Environment Fostering Student Creativity: A Multiple Mediation Analysis Using Smart PLS 4

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Abstract

Creativity should be seen as a critical skill for students in the twenty-first century and a stated objective of formal education that supports students in navigating an ambiguous future. There is evidence that a creative learning environment would encourage students to be more creative in the classroom, but research is lacking to support this. This study examines whether a creative learning environment will encourage students to be more creative in three ways: learning goal orientation, network links, and knowledge sharing, based on Amabile's componential theory of creativity. A total of 388 Chinese university students participated in the surveys. The collected data were analysed by SmartPLS 4, the approach of multiple mediation analysis. The results demonstrate that a creative learning environment makes students more focused on learning goals and more willing to share information, significantly positively affecting student creativity. However, network ties do not play a role in the link between a creative learning environment and student creativity. In the end, this study discusses the theoretical and educational implications of the results, the drawbacks of the study, and recommendations for future studies.

Keywords: Learning Goal Orientation, Knowledge Sharing, Network Ties, Creative Learning Environment, Student Creativity

1. Introduction

Creativity is increasingly valued today (Beghetto & Kaufman, 2014; Richardson & Mishra, 2018). People can absorb information more easily and learn more quickly when their mind is free to be creative (Soh, 2017). Since students are the main drivers of society's growth, universities worldwide have made it their mission to support and create innovation. Recently, researchers have started to look into how important the classroom setting is to improve students' creativity (Tsai et al., 2015). Some researchers have hinted that teachers who put more effort into making a learning environment that stresses the importance of creativity may help students be more creative (Balakrishnan, 2021; Richardson & Mishra, 2018). However, there is little research to investigate the factors regulating the connection between the creative learning environment and student creativity. This research aims to identify the numerous significant processes that occur between student creativity and creative learning environment and examine their relationships with student creativity and creative learning environment.

The dynamic componential theory of creativity is used in this study to build the connection between the creative learning environment and student creativity (Amabile & Pratt, 2016). This theory indicates that desirable situations can make people more creative by changing their motivations and behaviours in multiple ways. This basic method is based on the idea that individual motivation and interactions among people are important research tools. This paper suggests three ways to explain the relationship between student creativity and a creative learning environment: learning goal orientation, knowledge sharing, and network ties.

Typically, students who believe that learning, comprehension, and progress are personal objectives are considered to have a learning goal orientation. This shows that students want to learn independently to make creative things (Moe et al., 2019). Researchers have discovered that the classroom setting impacts how students perceive their objectives, and how students see their goals can lead to different learning behaviours and outcomes. Therefore, goals' personal and societal elements are highlighted in the study framework of achievement goal theory (Chazan et al., 2021). Scholars are mediating the role of learning goal orientation as a link between the creative learning environment and student creativity. This aligns with studies that show how important student enthusiasm is (Meece et al., 2006; Schuitema et al., 2014).

Students' social network connections in groups and/or classrooms are part of larger social networks and may improve the quality of the information they get (Hommes et al., 2012). According to Chow and Chan (2008), network ties, composed of events in class, impact how well students do and display how they interact with their professors and classmates in a classroom context. Even though it is known that fostering interpersonal connections might assist students in becoming more creative by sharing various types of information, it is yet unknown whether network links can exert an impact between a creative learning environment and the creativity of students (Cheng, 2011).

Scholars have also noticed that when students share what they know, they often use knowledge-based resources in class and outside of class to help them with their creative projects (Ansari & Khan, 2020). Managing knowledge, which includes developing changing knowledge, making innovative knowledge, and distributing important information, concepts, recommendations, and know-how to others, has been shown to help university students be more creative (Dei & van der Walt, 2020). In theory, creativity needs different kinds of knowledge and information (Fan & Cai, 2020). In contrast, it is uncertain whether sharing information in learning environments can help students be more creative (Bartol & Srivastava, 2002). This study hypothesises that a student's creativity and a creative learning situation might be linked through learning goal orientation, network ties, and knowledge sharing. The proposed framework is shown in **Figure 1**.

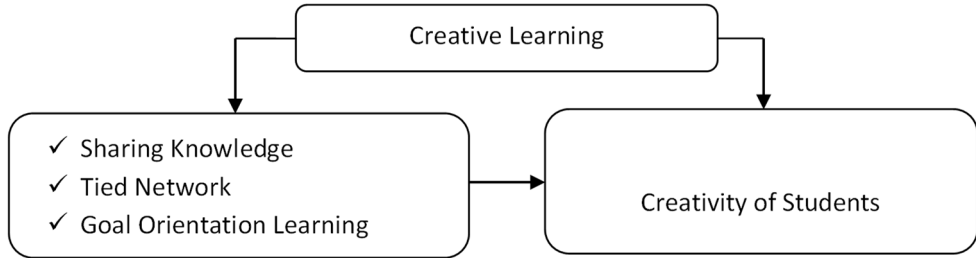


Figure 1: The proposed framework

2. Literature Review and Development of Hypotheses

2.1 Student creativity and creative learning environment

Creativity is often considered the competence to think creatively (Eshet & Margaliot, 2022). For instance, Amabile and Pratt (2016) define creativity as developing mutually unique and valuable philosophies widely used in education. According to Zeng et al. (2017), creativity is the capability to develop novel, good explanations for problems that arise through peer interaction and debate. It is vital to recognise how to encourage the creativity of students. To make students more creative in the classroom, experts recommend that teachers encourage them to ask more questions, think about why, how, and what their observations mean, and come up with more thoughtful questions (Paugh et al., 2010). In other words, by acting as helpful facilitators, instructors should encourage students to take measured risks and develop original solutions to issues (Chappell & Craft, 2011). Students might be more likely to do creative things in schools that actively encourage and support students' creative expression (Beghetto & Kaufman, 2014). Therefore, it is important to give students chances to try at school (Richardson & Mishra, 2018).

Several studies support the idea that the environment influences people's creativity (Kozbelt et al., 2010). A creative learning environment may aid students in becoming more creative. According to Mishra (2018), innovative learning atmosphere in the classroom values ideas and encourages students to take reasonable chances and make mistakes while studying. Consequently, students get the support necessary to develop their untapped possibilities (Skjelstad Fredagsvik, 2022). An assessment of the learning environment in a classroom reveals that students are more likely to continue developing their abilities and professional knowledge when they study in a creative learning environment. This helps them develop creative answers (R. S. Davies et al., 2013). Due to this, students are more creative and behave better in school (Mishra, 2018). Therefore, researchers suggest the following:

Hypothesis 1: There is a relationship between a creative learning environment and student creativity.

2.2 Learning goal orientation as a mediator

Goal orientation makes people want to do something (Wang et al., 2021). Importantly, desired environments have remarkably influenced learning goal orientation and make it easier for people to be creative (Malmberg, 2008; Schweder et al., 2019). Scholars have shown that a creative learning environment is a teaching space with a contingency-contract structure that makes students more likely to determine their learning goals and makes students work harder to get more done (Schweder et al., 2019; Self-brown & Mathews, 2003). It is highlighted that students may develop their abilities in this environment by exerting more effort and seeking opportunities to practise and grow better, leading to higher performance (Moe et al., 2019).

Theoretically, original works need the aptitude and skill to generate novel concepts and approaches. Therefore, original thought in the classroom is vital for the growth of knowledge (D. Davies et al., 2013). According to experts, a person's motivation to study might inspire them to do actions that ultimately benefit the development of inventive abilities (Gong et al., 2014). That is to say, when facing obstacles, students with well-defined learning objectives use their acquired knowledge and abilities more proactively and constructively (Chan & Yuen, 2014). Therefore, these students may be more intrinsically driven to generate novel concepts (Shin et al., 2012).

This study aims to determine whether or not a student's motivation to learn plays a mediating role in the relationship between a stimulating classroom setting and their level of originality. Particularly, students with access to flexible classroom space may be more likely to adopt a goal-oriented learning strategy, equipping them with the means to be imaginative. Therefore, this research proposes the following:

Hypothesis 2: Learning goal orientation mediates the relationship between a creative learning environment and student creativity.

2.3 Knowledge sharing as a mediator

Generally speaking, knowledge sharing denotes the transfer of information and expertise between individuals, communities, and businesses (Eid & Al-Jabri, 2016). In the past, there have been many studies about the value of students teaching one another in the classroom. Students construct their understanding by integrating classroom instruction with real-world applications (Chang & Chuang, 2011). Students are more inclined to collaborate and share what they have learned if encouraged to utilise their imaginations in the classroom. This broadens their exposure to information, allowing them to think of novel approaches to resolving issues. That is why they succeed academically (Eid & Al-Jabri, 2016).

The research indicates that students who share their knowledge are much more able to generate fresh ideas in class. In particular, information sharing can facilitate future learning, enhancement of existing knowledge, and compilation of more data (Yeh et al., 2012). It was found that the more people communicated knowledge, the more unique pieces of information emerged (Eid & Al-Jabri, 2016; Farnese et al., 2019). Students may gain from the collective intelligence that will enrich their understanding and spark new avenues of thought. It is in this context that the study proposes the following:

Hypothesis 3: Knowledge sharing mediates the relationship between a creative learning environment and student creativity.

2.4 Network ties as a mediator

It is reported that social capital places a premium on individuals' connections with others (Dawson, 2008). Stronger linkages indicate greater emotional intimacy, while weaker links are more likely to have redundant connections and are associated with less relevant information (Perry-Smith, 2006). Classrooms configured in various ways to best serve the needs of the students enrolled in them can serve as a fertile ground for the development of students' personal and professional networks (Mishra, 2018).

According to previous studies, a student's social capital is a major aspect that facilitates their creativity (Eid & Al-Jabri, 2016). Students are more likely to initiate conversations with those who share their interests and form friendships with others around them (such as classmates) at school (Sam Liu, 2017). Because of this, they have an easier time coming up with solutions to issues and original ideas on how to approach them. Students may benefit from social network ties as they provide another avenue for meeting individuals (Ellison et al., 2006; Parks, 1996). The fresh links they have established may aid them in finding novel solutions to their problem (Beghetto & Kaufman, 2014; Soh, 2017).

It is hypothesised that the presence of strong network relationships is a necessary condition for a creative learning environment to flourish. When students believe they will be able to develop their creative skills in the classroom, they are more inclined to reach out to classmates and teachers. Because of this, students are more likely to create relationships with individuals, such as teachers and classmates, who may provide them with useful knowledge and, fresh perspectives, moral and psychological support, and therefore foster their creativity (Ellison et al., 2007). As a result, this study hypothesises that:

Hypothesis 4: Network ties mediate the relationship between the creative learning environment and student creativity.

3. Methodology

A total of 388 students from universities in China participated in this research. Heilongjiang, Henan, Hunan, Hubei, Anhui, Shanxi, Jilin, and Jiangxi are some of the provinces that make up this region. Questions were distributed to undergraduate students, in particular when they were in class. The findings showed that 52.84% of the 205 survey takers were female, and 47.16% were male. The participants had not received any prior training in creativity and were unaware of the study's objectives. The instructor assured the class that their responses to the survey would be kept strictly confidential and utilised for academic purposes only. Each question on the scale might have been answered correctly. Instead, students were instructed to respond to each question with their ideas. The instructor reviewed the survey responses to determine the level of student creativity.

In order to ensure that participants provided accurate responses, this study operationalised all aspects of the study using pre-existing measures that have already been demonstrated to be valid and reliable in prior research. All the scales saw extensive application in the realms of both academic study and classroom instruction. All characteristics are evaluated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). For this research, the original English text was translated into Chinese using the back-translation method (Brislin, 1986). Later, the information was analysed using the multiple mediation analysis function in SmartPLS 4.

4. Results

4.1 Measurement model assessment

4.1.1 Reliability and validity

Cronbach's alpha, composite reliability and average variance extracted (AVE) are adopted to establish the model's reliability and validity. As shown in **Table 1**, Cronbach's alpha values, composite reliability (rho c), and composite reliability (rho a) for a creative learning environment, knowledge sharing, learning goal orientation, network links, and student creativity are all higher than 0.700. These findings show that the model's reliability level is satisfactory (Hair et al., 2014). The AVE values for a creative learning environment, sharing knowledge, focusing on learning goals, network links, and student creativity are 0.683, 0.664, 0.683, 0.723, and 0.657, respectively. All of these numbers are higher than 0.500, showing enough convergent validity (Hair et al., 2014).

Table 1: Reliability and Validity

Latent variable	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted
Creative Learning Environment	0.964	0.967	0.968	0.683
Knowledge Sharing	0.746	0.753	0.855	0.664
Learning Goal Orientation	0.844	0.845	0.896	0.683

Latent variable	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted
Network Ties	0.809	0.821	0.886	0.723
Student Creativity	0.825	0.826	0.884	0.657

4.1.2 Discriminant reliability

The Fornell-Larcker criteria are used to check and validate discriminant validity. This is done to determine how different each latent variable is from other constructs (Hair et al., 2014). In the correlation matrix of the Fornell-Larcker's criterion, the square root of the AVE of the construct is shown in bold on the diagonal of Fornell-Criteria Larcker's correlation matrix (**Table 2**). In contrast, the other values show associations with other constructs. To develop discriminant validity, it is necessary to demonstrate that the square root of individual AVE (bolded on the diagonal) is more than the corresponding inter-construct relationships. All diagonal values are found to be larger than their non-diagonal counterparts. Consequently, the framework's discriminant validity is sound.

Table 2: Fornell-Larcker Criterion

Latent variable	Creative Learning Environment	Knowledge Sharing	Learning Goal Orientation	Network Ties	Student Creativity
Creative Learning Environment	0.826				
Knowledge Sharing	0.511	0.815			
Learning Goal Orientation	0.443	0.477	0.826		
Network Ties	0.383	0.595	0.561	0.850	
Student Creativity	0.465	0.617	0.630	0.631	0.810

The Heterotrait-Monotrait (HTMT) ratio is also discovered to be an improved method for determining the discriminant's reliability. The HTMT ratios are all smaller than 0.9 (**Table 3**), which reveals good discriminant's reliability, according to (Henseler et al., 2016).

Table 3: Heterotrait-Monotrait (HTMT) Ratio

Latent variable	Creative Learning Environment	Knowledge Sharing	Learning Goal Orientation	Network Ties	Student Creativity
Creative Learning Environment					
Knowledge Sharing	0.592				
Learning Goal Orientation	0.490	0.597			
Network Ties	0.424	0.772	0.675		
Student Creativity	0.513	0.786	0.754	0.765	

4.1.3 Factor loadings

Latent variable types and their respective factor loadings are shown in **Figure 2**. Their factor loadings show the strength of various construct indicators. The factor loading must be more than 0.700 for the application to be considered. Each indication for a single build has a positive factor loading.

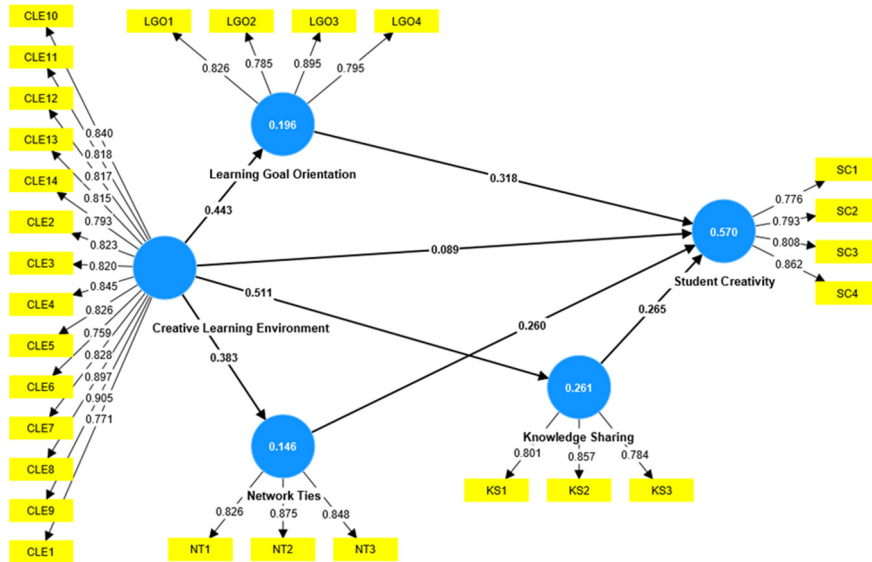


Figure 2: PLS path model

4.1.4 R Square

Table 4 displays the latent variable values for R square and Adjusted R square. Significant ($R=0.750$), moderate ($R=0.500$), and weak ($R=0.250$) are all valid ranges for the R^2 statistic (Hair et al., 2014). Knowledge sharing has a moderately weak R^2 value of 0.260, learning goal orientation has a weak value of 0.196, network relationships have a weak value of 0.146, and student creativity has a moderately strong value of 0.570.

Table 4: R square

Latent variable	R-square	R-square adjusted
Knowledge Sharing	0.261	0.259
Learning Goal Orientation	0.196	0.194
Network Ties	0.146	0.144
Student Creativity	0.570	0.565

4.2 Structural Model Assessment

Bootstrapping is a way to look at and figure out how important a model is. The t-statistic value shows how important route coefficients are. Figure 3 shows that, at a significance level of 0.05, there are five relationships worth paying attention to. The total effect of a creative learning environment and knowledge sharing is significant at 0.598, $t = 11.774$ ($p < 0.05$). The total effect of a creative learning environment on learning goal orientation is significant at 0.490, $t = 9.779$ ($p < 0.05$). The total effect of a creative learning environment on network ties is significant at 0.429, $t = 7.640$ ($p < 0.05$). Moreover, the total effect of a creative learning environment and student creativity is significant at 0.520, $t = 9.938$ ($p < 0.05$). Knowledge sharing and student creativity are significant at 0.391, $t = 2.481$ ($p < 0.05$). Learning goal orientation and student creativity is significant at 0.368, $t = 3.315$ ($p < 0.05$). However, the total effect of network ties and student creativity is insignificant at 0.216, $t = 1.470$ ($p > 0.05$), as is the total effect between creative learning environment and student creativity (original

sample = 0.013, p-value = 0.851).

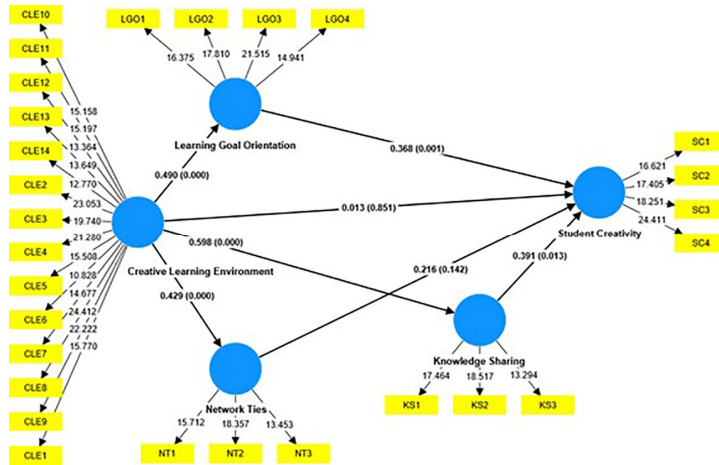


Figure 3: Structural model

4.3 Mediation analysis

The total indirect and specific indirect effects are obtained for the mediation analysis. **Tables 5 and 6** show what happens as a result. **Table 5** shows the significant direct relationship between creative learning environment and student creativity (Original sample = 0.507, $t = 8.216$, $p < 0.05$), supporting Hypothesis 1.

Table 5. Total indirect effects

Hypothesis	Relationship	Original sample	T statistics	P values	Decision
H1	Creative Learning Environment -> Student Creativity	0.507	8.216	0.00	Supported

The results in **Table 6** show that learning goal orientation (original sample = 0.181, $t = 3.057$, $p < 0.05$) and knowledge sharing (original sample = 0.2340, $t = 2.367$, $p < 0.05$) are significant mediators between the creative learning environment and student creativity. This means that hypotheses 2 and 3 are true. However, network ties as a mediator do not affect the relationship between the creative learning environment and student creativity. Hypothesis 4 is not supported.

Table 6: Specific indirect effects

Hypothesis	Relationship	Original sample	T statistics	P values	Decision
H2	Creative Learning Environment -> Learning Goal Orientation -> Student Creativity	0.181	3.057	0.002	Supported
H3	Creative Learning Environment -> Knowledge Sharing -> Student Creativity	0.234	2.367	0.018	Supported
H4	Creative Learning Environment -> Network Ties -> Student Creativity	0.093	1.469	0.142	Not Supported

5. Discussion

This research examines student creativity by encouraging students to think creatively in the classroom. This is accomplished by developing and evaluating a mediation model that explores the interplay between a conducive learning environment and individual student creativity. The findings indicate that students benefit from a creative learning environment because it enables knowledge distribution and the achievement of learning objectives. However, concurrent network connections have no impact.

5.1 Theoretical implications

The primary objective of this research was to investigate the potential benefits to student creativity of a classroom setting designed to foster such an atmosphere. There are several ways in which this research contributes to expanding human understanding. First, this research fills a vacuum regarding what may happen to students' imaginations in a more imaginative classroom. No evidence supports the assumption that a classroom atmosphere fostering students' creative expression leads to improved academic performance (Bereczki & Kárpáti, 2021; Richardson & Mishra, 2018).

The authors of this research are among the first to attempt to investigate the effects of a creative learning environment on students' creativity by examining numerous processes from multiple perspectives simultaneously. Using the dynamic componential model, new insights into the roles of learning goals, network connections, and information transfer as distinct mediators have been uncovered. More and more researchers have shown that the effectiveness of environmental predictors of creativity might be seen in discovering alternative solutions (Amabile & Pratt, 2016). However, few investigations have explored the potential for simultaneous mediation or examined the level of originality shown by undergraduates. The results of this investigation provide valuable insight into the processes through which today's students develop their original ideas. It demonstrates that students may become even more creative when exposed to an atmosphere encouraging them to think outside the box and share and discuss ideas with their peers.

5.2 Educational implications

The findings demonstrate the need to include creative features in a classroom's design to foster students' innovative thinking. In order to motivate students to put in extra effort and think creatively, teachers may implement strategies such as creating channels of free and open communication, taking calculated risks, supporting creative ideas, and giving students more freedom and choice as they work through their assignments. Teachers should prioritise students' knowledge of ideas above course marks and encourage them to put effort ahead of course scores since students' learning goal orientation and information sharing are crucial to taking advantage of a creative learning environment (Lerang et al., 2018). Teachers may adjust their expectations of their students and emphasise creative thinking if they do this. Students might benefit from training programs to help them better manage their and others' social ties. They might improve their academic performance and acquire valuable classroom collaboration skills using this. Finally, educators may continue to emphasise the significance of information exchange, which can assist students in acquiring new knowledge that can enhance their learning and performance.

5.3 Limitations

This study has a few limitations. Firstly, it is important to note that cross-sectional studies cannot eliminate the issue of cause and effect. For instance, the development of a creative learning environment in the classroom may be aided by student ingenuity. Complex tests may be used to determine the chain of events. Secondly, the findings demonstrate some mediation impacts, but

additional study is needed to understand how a creative learning environment improves student creativity completely. One such mediator is the way students learn in groups. More research with different samples (such as graduate students) may make it more comprehensive to generalise the conclusions of the present study beyond its sample of Chinese undergraduates.

6. Conclusion

Scholars have been attempting to find out how to make students more creative since educating them to be creative is a difficult and pressing issue for future curriculum development. Undergraduate students' originality is examined concerning the influence of a supportive learning environment. When exposed to an environment that supports creativity, students are more willing to accomplish their learning goals, convey pertinent information, and create professional networks. The logical inference is that educators and researchers should prioritise the development of novel educational settings that encourage students to take a proactive role in their education and foster a culture of collaboration and openness. In order to address the important challenge of teaching students to be creative, academics have been focusing on finding ways to encourage students' creative thinking as a priority for future curriculum development. This research aims to determine if and how different variables affect how creative university students are. The research results imply that an environment that encourages innovative thinking may aid students in focusing on their academic work, working together on projects, and forming deep relationships. The conclusion is that teachers and researchers need to put more effort into making innovative classrooms where students are encouraged to set and work toward specific learning goals and where they feel comfortable making and keeping deep relationships with peers.

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