

From Image Cognition to Aesthetic Creation: A Study on the Path of Primary School Photography Education in Promoting Children's Aesthetic Ability Development

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Abstract: Photography education, as an intuitive visual art form, has gradually become an important medium for promoting the development of children's aesthetic abilities. This study selected 60 students aged 7-8 years from the first grade of a certain primary school as the research subjects. The photography education scale, image cognition ability scale, and children's aesthetic ability development assessment questionnaire were used for the investigation. Through descriptive statistical analysis, correlation analysis, and mediation and moderation effects, the mediating role of image cognition ability between photography education and children's aesthetic ability development was examined, as well as the moderating role of teacher guidance styles. The results showed that photography education activities could promote the development of children's aesthetic abilities. Image cognition ability played a partial mediating role between photography education and children's aesthetic ability development. The influence of photography education on the facilitative teacher guidance style was significantly greater than that of the directive teacher guidance style, while the influence of image cognition ability on the directive teacher guidance style was significantly greater than that on the facilitative teacher guidance style.

Keywords: Image cognition; Photography education; Aesthetic ability; Moderated mediation effect

1. Introduction

Aesthetics is a special form of human understanding of the world, referring to a non-utilitarian, visual and emotional state of relationship between humans and the world [1-2]. Image cognition is an important way to promote aesthetic creation. Image cognition refers to the recognition, comparison and discrimination of the form characteristics such as shape, color, proportion and texture, as well as the material, technique and style characteristics of various image symbols in artworks, digital images, film and television works or images in daily life [3-5]. For children, image cognition is their unique image experience based on certain aesthetic norms, which enables them to have original aesthetic understanding and cognition of images, thereby reconstructing their image experience and improving their aesthetic ability [6-9]. Primary school photography education plays an important role in promoting children's image cognition and aesthetic ability development.

Photography, as an art form, can capture the moments of life through the lens, and also express the emotions and viewpoints of the photographer. In today's society, primary school photography education is gradually receiving attention and is regarded as an important way to promote the development of children's aesthetic ability [10-11]. Firstly, photography education can cultivate students' observation skills. Photography as an art form requires photographers to observe the environment and things around them carefully and capture those tiny and unique moments [12-13]. In photography education, students



need to improve their observation skills by observing different themes, compositions and elements. This can enable students to more sensitively perceive the beauty and harmony of the world around them, thereby cultivating their aesthetic taste [14-16]. Secondly, photography as an art form requires photographers to deeply understand the connotations and emotions of different themes and express them through images. By learning and recognizing different photography works and the image works of artists, students can gradually cultivate their aesthetic taste and hone their sensitivity to beauty.

This article takes 60 children in the first grade of a certain primary school as the research subjects, and uses the photography education scale, image cognition ability scale and children's aesthetic ability development scale to conduct a survey and research on primary school teachers. The experimental group and the control group each have 30 children. They design photography education activities and conduct a three-month teaching experiment. From five dimensions of aesthetic perception, aesthetic understanding, aesthetic emotion, aesthetic imagination, aesthetic creation ability and aesthetic ability, this study explores the impact of photography education activities on children's aesthetic ability. Finally, it examines the mediating role of image cognition ability between photography education and children's aesthetic ability development, and analyzes the moderating role of the teacher's guidance style.

2. Research Methods

2.1. Research Subjects

By using a convenient sampling method, 60 questionnaires were distributed to the teachers of the first grade of a certain primary school. The average teaching experience of the primary school teachers was 8.36 (SD = 6.11) years, and the average age was 32.33 (SD = 7.83) years. In this study, 30 children were randomly selected from each of the two first-grade classes as the experimental group and the control group. All the selected subjects were aged between 7 and 8 years old.

2.2. Research Tools

2.2.1. Primary School Photography Education

The Primary School Teachers' Photography Education Evaluation Scale was used to assess the situation of photography education among primary school teachers. There were 25 items in total, including three subscales: visual language cognition, technical operation practice, and theme expression and creation. The scale used a 5-point scoring method (1 = "very inconsistent", 5 = "very conforms"). The fit indices of confirmatory factor analysis were good: $\chi^2 / df = 6.33$, CFI = 0.995, TLI = 0.981, RMSEA = 0.076, SRMR = 0.042, indicating that the questionnaire has good structural validity. In this study, the Cronbach's alpha coefficient of the scale was 0.78.

2.2.2. Image Cognition Ability

The test was conducted using the image cognition ability test scale, and evaluated by the teachers. The questionnaire adopted a 5-point scoring method (1 = "very inconsistent", 5 = "completely conforms"), with higher scores indicating a higher level of image cognition ability. The fit index of the confirmatory factor analysis was good: $\chi^2 / df = 2.356$, CFI = 0.944, TLI = 0.923, RMSEA = 0.039, SRMR = 0.042. In this study, the Cronbach's alpha coefficient of the scale was 0.78.

2.2.3. Children's Aesthetic Ability

The test was conducted using the Children's Aesthetic Ability Scale, which covered 5 dimensions: aesthetic perception, aesthetic understanding, aesthetic emotion, aesthetic imagination, and aesthetic creativity, with a total of 10 items. The scoring method used was a 3-point scale (1 = "very inconsistent", 2 = "relatively conforms", 3 = "very conforms"). The fit indices of the confirmatory factor analysis were excellent: $\chi^2 / df = 4.996$, CFI = 0.956, TLI = 0.976, RMSEA = 0.065, SRMR = 0.036. In this study, the Cronbach's alpha coefficient of the questionnaire was 0.88.

2.3. Experimental Procedures and Variable Control

The independent variable of this study is photography education. The dependent variable is the five dimensions of children's aesthetic ability - aesthetic perception, aesthetic understanding, aesthetic emotion, aesthetic imagination and aesthetic creation ability. Image cognition ability is selected as the mediating variable, and teacher guidance style is chosen as the moderating variable. The control variables

mainly include: 1. The two groups of children are basically matched in terms of age, gender, family background and previous art experience. 2. During the experiment, regular photography education activities are carried out, and other courses and daily activities remain consistent to avoid additional interference. 3. All tests are administered by the same trained evaluator in a standardized environment to reduce measurement errors.

This study uses the designed photography education program as the carrier, conducts teaching experiments on the children in the experimental group, and replaces the original regular activities. This program is centered around the three core dimensions of photography education:

(1) Visual language cognition: Through activities such as "finding lines" and "color emotion cards", guide children to recognize basic visual elements such as points, lines, and planes.

(2) Technical operation practice: Using mobile phones or simple digital cameras, learn basic skills such as focusing and composition.

(3) Theme expression and creation: Conduct project-based creation, encourage children to tell stories with photos and words, and hold small "class photography exhibitions" to promote aesthetic expression and social sharing.

The teaching experiment lasts for nearly 3 months. The experimental group conducts a collective photography education activity once a week, each lasting 30 minutes. While the children in the control group do not have regular photography education activities. Both groups of children must participate in the pre-test and post-test before and after the experiment to obtain the corresponding data. In addition, to ensure research ethics, all participating children and their parents signed informed consent forms, and the experimental process respects the children's will and allows them to withdraw at any time.

2.4. Statistical Methods

This study employed SPSS software for statistical analysis. The author input the scores of the children in the experimental group and the control group in the five dimensions of aesthetic ability before and after the test, respectively, to prepare for the data analysis. Firstly, an independent sample t-test was conducted on the scores of the five dimensions of aesthetic ability of the two groups of children in the pre-test to examine the differences in the level of aesthetic ability between the two groups before the experiment. Secondly, an independent sample t-test was conducted on the scores of the five dimensions of aesthetic ability of the two groups of children in the post-test to examine the differences in the level of aesthetic ability between the two groups after the experiment. Then, a paired sample t-test was conducted on the pre- and post-test scores of the five dimensions of aesthetic ability of the children in the experimental group to analyze the significance of the changes in the aesthetic ability of the experimental group children after the intervention. A paired sample t-test was conducted on the pre- and post-test scores of the five dimensions of aesthetic ability of the children in the control group to analyze the significance of the changes in the aesthetic ability of the control group children without the intervention. Finally, the mediating role of image cognition ability between photography education and the development of children's aesthetic ability, as well as the moderating role of the teacher's guidance style, were examined. Through the comprehensive examination of the experiment, the influence of photography education activities on the aesthetic ability of primary school children was investigated.

3. Research Results and Analysis

3.1. Descriptive Statistical Analysis

3.1.1. Pre-test of aesthetic ability development of the two groups of children

To assess the current level of aesthetic ability development among the two groups of children and provide a reference basis for the design and implementation of subsequent photography activities, before the start of the experiment, the "Observation and Evaluation Form of Children's Aesthetic Ability" was used to conduct pre-tests on the children in the experimental group and the control group respectively. The comparison of the differences in the development of aesthetic ability between the two groups of children before the experiment is shown in Table 1. According to the independent sample t-test, it was found that there were no significant differences in aesthetic ability across various dimensions between the two groups of children ($p > 0.05$). The research results indicate that there was no significant difference in the aesthetic development levels of the children in the experimental group and the control group before the experimental intervention.

Table 1. Test of differences in aesthetic ability development before the experiment

Dimension	Grouping	N	M	SD	MSE	t	Sig.(Double tails)
Aesthetic perception	Experimental Group	30	1.9000	0.25019	0.04952	0.469	0.629
	Control group	30	1.8800	0.33935	0.06821		
Aesthetic understanding	Experimental Group	30	1.8800	0.44483	0.08885	0.302	0.764
	Control group	30	1.8300	0.51799	0.10486		
Aesthetic emotion	Experimental Group	30	1.7200	0.4574	0.09192	-0.306	0.75
	Control group	30	1.7600	0.43588	0.08724		
Aesthetic imagination	Experimental Group	30	1.9000	0.43948	0.0882	0.49	0.622
	Control group	30	1.8300	0.4533	0.09066		
Aesthetic creation	Experimental Group	30	1.8000	0.38277	0.077	-0.203	0.845
	Control group	30	1.8300	0.37776	0.07616		

3.1.2. Comparison of the Development Differences in Aesthetic Ability between the Two Groups of Children after the Experiment

After conducting an eight-week photography education program for the children in the experimental group, the aesthetic ability development levels of the children in the experimental group and the control group were measured again using the "Observation and Evaluation Form for Aesthetic Ability of Middle-Class Children", and a difference test was carried out. The difference test of the aesthetic ability development of the two groups of children after the experiment is shown in Table 2. The differences in the development levels of aesthetic understanding, aesthetic emotion, aesthetic imagination, and aesthetic creation of the two groups of children after the experiment were significant ($p < 0.001$), and the difference in aesthetic perception ability was also significant ($p < 0.01$). The experimental results indicate that the photography education program had a significant impact on the children in the experimental group.

Table 2. Test of the differences in aesthetic ability development

Dimension	Grouping	N	M	SD	MSE	t	Sig.(Double tails)
Aesthetic perception	Experimental Group	30	2.2100	0.29214	0.0587	3.167	0.004
	Control group	30	1.9800	0.33319	0.06602		
Aesthetic understanding	Experimental Group	30	2.2400	0.32687	0.0653	3.719	0.000
	Control group	30	1.9200	0.27732	0.05461		
Aesthetic emotion	Experimental Group	30	2.1800	0.24498	0.04945	4.016	0.000
	Control group	30	1.8400	0.34511	0.06834		
Aesthetic imagination	Experimental Group	30	2.3000	0.28897	0.05834	4.319	0.000
	Control group	30	1.9800	0.2993	0.06016		
Aesthetic creation	Experimental Group	30	2.3200	0.27834	0.05485	4.648	0.000
	Control group	30	1.9800	0.26938	0.05412		

3.1.3. Changes in Aesthetic Ability of the Experimental Group Before and After the Experiment

Paired sample t-tests were conducted on the pre- and post-test data of the aesthetic ability of the children in the experimental group. The differences in the development level of the children's aesthetic ability before and after the experiment are shown in Table 3. After conducting photography education activities for the experimental group, the children's aesthetic abilities in each dimension have all improved. The differences in the dimensions of aesthetic emotion, aesthetic imagination, and aesthetic creation ability were significant ($p < 0.001$), while the differences in aesthetic perception and aesthetic understanding ability were significant ($p < 0.01$). The overall results indicate that after the experimental

group participated in the photography education activities, the development of each dimension of the children's aesthetic ability has been significantly improved.

Table 3. The experimental group was tested for different levels of aesthetic ability

Pre - and post-test.		Pairing difference					t	Sig.(Double tails)
		M	SD	MSE	95%CI			
					LL	UL		
Aesthetic perception	Pre-post	-0.31000	0.42989	0.08625	-0.49771	-0.14175	-3.622	0.001
Aesthetic understanding	Pre-post	-0.36000	0.54501	0.10897	-0.60519	-0.1544	-3.499	0.003
Aesthetic emotion	Pre-post	-0.46000	0.5379	0.10839	-0.68218	-0.23668	-4.229	0.000
Aesthetic imagination	Pre-post	-0.40000	0.4936	0.09813	-0.62384	-0.21665	-4.346	0.000
Aesthetic creation	Pre-post	-0.52000	0.40606	0.08092	-0.70778	-0.37228	-6.676	0.000

3.1.4. Changes in aesthetic ability of the control group before and after the experiment

A paired-sample t-test was conducted on the pre- and post-test data of the aesthetic ability of the control group children. The differences in the development level of the aesthetic ability of the control group children before and after the test are shown in Table 4. Although the post-test scores of the aesthetic ability dimensions of the control group children who did not receive photography education activities were higher than the pre-test scores, the paired-sample t-test showed that there were no significant differences in the aesthetic perception, aesthetic understanding, aesthetic emotion, aesthetic imagination, and aesthetic creation abilities of the control group children ($p > 0.05$). The research results indicate that the control group children who did not receive the intervention of photography education activities did not have a significant change in their aesthetic ability development.

Table 4. The control group aesthetic ability development level before and after survey

Pre - and post-test.		Pairing difference					t	Sig.(Double tails)
		M	SD	Average standard error	95% confidence interval of difference			
					Lower limit	Upper limit		
Aesthetic perception	Pre-post	-0.10000	0.18778	0.0371	-0.15664	-0.00287	-2.093	0.041
Aesthetic understanding	Pre-post	-0.09000	0.47923	0.09545	-0.2976	0.09779	-1.01	0.303
Aesthetic emotion	Pre-post	-0.08000	0.47115	0.09429	-0.27378	0.11459	-0.971	0.409
Aesthetic imagination	Pre-post	-0.15000	0.50598	0.10158	-0.32902	0.08906	-1.171	0.246
Aesthetic creation	Pre-post	-0.15000	0.5538	0.11055	-0.38905	0.06867	-1.434	0.162

3.2. Mean Values and Correlation Analysis of Each Variable

The mean values, standard deviations and correlation matrices of each variable are shown in Table 5. 1-12 represent the teacher's guidance style, visual language cognition, technical operation practice, theme expression and creation, total score of photography education, total score of image cognition ability, aesthetic perception, aesthetic understanding, aesthetic emotion, aesthetic imagination, aesthetic creation ability and total score of aesthetic ability. Descriptive statistics and correlation analysis results indicate that photography education, image cognition ability and children's aesthetic ability are pairwise correlated. Children's aesthetic ability has a significant positive correlation with photography education and image cognition ability, with correlation coefficients r of 0.663** and 0.753** respectively.

Table 5. The mean, standard deviation and correlation matrix of each variable

	1	2	3	4	5	6	7	8	9	10	11	12
1	-											
2	0.085	-										
3	0.172**	0.803**	-									
4	0.192**	0.806**	0.845**	-								
5	0.149*	0.928**	0.948*	0.96**	-							
6	0.098	0.62**	0.573**	0.659**	0.665**	-						
7	-0.017	0.325**	0.313**	0.319**	0.338**	0.292**	-					
8	0.031	0.554**	0.506**	0.553**	0.567**	0.724**	0.826**	-				
9	0.114*	0.66**	0.561**	0.603**	0.655**	0.708**	0.212**	0.511**	-			
10	0.138**	0.682**	0.541**	0.624**	0.654**	0.722**	0.226**	0.538**	0.85**	-		
11	0.039	0.584**	0.46**	0.54**	0.556**	0.726**	0.205**	0.517**	0.808**	0.838**	-	
12	0.114*	0.678**	0.543**	0.641**	0.663**	0.753**	0.227**	0.54**	0.958**	0.959**	0.901**	-
M	0.69	2.86	2.7	2.94	2.76	2.91	1.4	2.11	2.27	3.02	3.09	2.79
SD	0.43	0.61	0.66	0.65	0.78	0.63	0.61	0.52	0.86	0.8	0.76	0.57

3.3. The Relationship between Photography Education and Children's Aesthetic Ability

(1) Test of the mediating effect model of image cognition ability

Based on the research of the moderated mediation model, in this study, the author first used the SPSS macro program PROCESS model 4 to test the mediating role of image cognition ability between photography education and children's aesthetic ability. The mediating model test of image cognition ability is shown in Table 6, *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. The results show that photography education significantly positively predicts image cognition ability ($\beta = 0.67$, $t = 15.32$, $p < 0.001$) and children's aesthetic ability ($\beta = 1.12$, $t = 19.32$, $p < 0.001$). When both photography education and image cognition ability are entered into the regression equation, image cognition ability significantly positively predicts children's aesthetic ability ($\beta = 0.31$, $t = 5.26$, $p < 0.001$), and the positive predictive effect of photography education on children's aesthetic ability has decreased somewhat, but still reaches a significant level ($\beta = 0.88$, $t = 12.34$, $p < 0.001$).

Table 6. The mediating model test of image cognitive ability

Predictor variable	Equation 1:Image cognitive ability			Equation 2:Aesthetic ability			Equation 2:Aesthetic ability		
	β	SE	t	β	SE	t	β	SE	t
Photography education	0.67	0.05	15.32***	1.12	0.08	19.32***	0.88	0.08	12.34***
Image cognitive ability							0.31	0.05	5.26***
R ²		0.36			0.47			0.43	
F		75.65***			116.24***			98.32***	

The decomposition of direct effect, mediating effect and total effect is shown in Table 7. The percentile Bootstrap method for bias correction test indicates that the mediating role of image cognitive ability between photography education and children's aesthetic ability is significant. The 95% confidence interval is [0.11, 0.33], and the proportion of the mediating effect to the total effect is 21.43%.

Table 7. Decomposition of direct effects, mediating effects and total effects

	Effect value	Boot SE	Boot LLCI	Boot ULCI	Effect proportion
Direct effect	0.88	0.09	0.65	0.97	78.57%
Mediating effect	0.24	0.09	0.11	0.33	21.43%
Overall effect	1.12	0.18	0.76	1.3	

(2) Test of the moderated mediation effect model

The model using the SPSS macro program PROCESS was employed to test the moderated mediation model. The test of the moderated mediation model is shown in Table 8. The test results of the moderated mediation model are presented in Figure 1. The results indicate that after incorporating the teacher's guidance style into the model, the interaction term between photography education and the teacher's

guidance style has a significant positive predictive effect on children's aesthetic ability ($\beta = 0.31$, $t = 2.68$, $p < 0.01$), and the interaction term between image cognition ability and the teacher's guidance style also has a significant predictive effect on children's aesthetic ability ($\beta = -0.4$, $t = -2.51$, $p < 0.05$). This shows that the teacher's guidance style not only moderates the direct predictive effect of photography education on children's aesthetic ability, but also moderates the latter half of the mediating role of image cognition ability.

Table 8. Moderated mediation model testing

Predictor variable	Equation 1:Image cognitive ability			Equation 2:Aesthetic ability		
	β	SE	t	β	SE	t
Photography education	0.65	0.03	15.65***	0.65	0.01	5.63***
Image cognitive ability				0.54	0.23	4.42***
Teacher guidance style				7.45	9.8	0.77
Photography education $\times$ Teacher guidance style				0.31	0.05	2.68**
Image cognitive ability $\times$ Teacher guidance style				-0.4	0.11	-2.51*
R ²		0.36			0.53	
F		223.65***			81.65***	

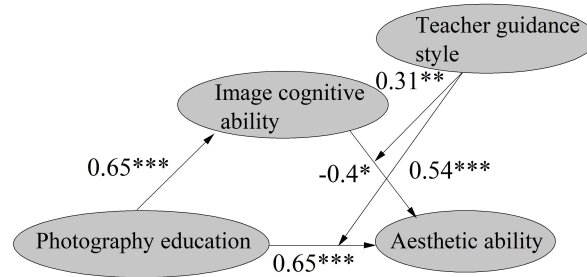


Figure 1. The test results of the moderated mediation model.

To further explain the moderating effect of the teacher's instructional style, the teacher's instructional style was divided into two groups: directive and stimulating. A simple slope test was conducted. The mediating effect and direct effect of the teacher's instructional style on the different aspects are shown in Table 9. The moderating effect of the teacher's instructional style on photography education and children's aesthetic ability is shown in Figure 2. When the teacher's instructional style is directive, photography education has a significant positive predictive effect on aesthetic ability (simple slope = 0.67, $p < 0.001$, 95% CI [0.43, 0.86]). When the teacher's instructional style is stimulating, the significant positive predictive effect of photography education on aesthetic ability is greater (simple slope = 0.98, $p < 0.001$, 95% CI [0.85, 1.19]). The moderating effect of the teacher's instructional style on image cognitive ability and children's aesthetic ability is shown in Figure 3. When the teacher's instructional style is directive, image cognitive ability has a significant positive predictive effect on aesthetic ability (simple slope = 0.55, $p < 0.001$, 95% CI [0.33, 0.86]). When the teacher's instructional style is stimulating, although image cognitive ability also has a positive predictive effect on aesthetic ability, its predictive effect is relatively weaker (simple slope = 0.27, $p < 0.01$, 95% CI [0.08, 0.33]). This indicates that the influence of image cognitive ability on the directive teacher's instructional style is more significant than that on the stimulating teacher's instructional style.

Table 9. The mediating effect and direct effect on different teachers' guidance styles

	Teacher guidance style	Effect	SE	t	LLCI	ULCI
The mediation effect of image cognitive ability	Directive type	0.55	0.14	4.63***	0.33	0.86
	Heuristic type	0.27	0.06	2.87**	0.08	0.33
Direct effect	Directive type	0.67	0.12	5.56***	0.43	0.86
	Heuristic type	0.98	0.08	11.18***	0.85	1.19

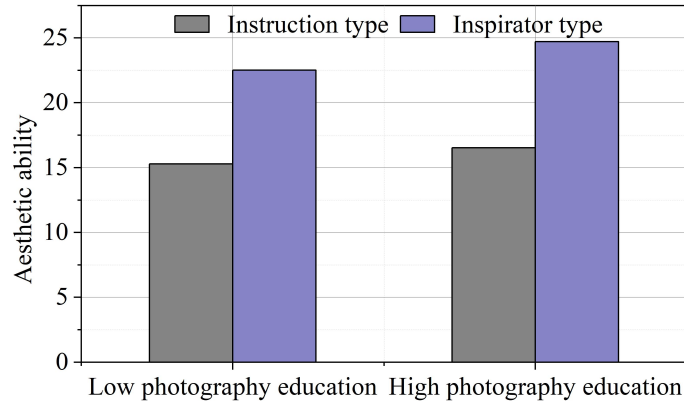


Figure 2. The adjustment of teacher's guidance style

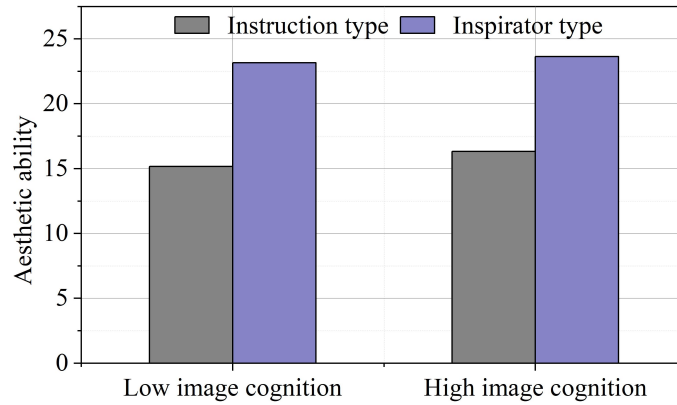


Figure 3. The adjustment of teacher's guidance style

4. Conclusion

Throughout history, the cultivation of children's aesthetic ability has always been a key aspect of children's education. This study selected 60 children from the first grade of a certain primary school as the research subjects. Through teaching experiments, it verified the impact of photography education activities on children's aesthetic ability. The study reached the following conclusions:

(1) This study conducted pre-test and post-test analyses of children's aesthetic ability through experimental and observational methods. The results showed that after conducting photography education activities, there were significant differences in the dimensions of aesthetic emotion, aesthetic imagination, and aesthetic creation ability of the experimental group children ($p < 0.001$). This indicates that photography education activities can promote the development of children's aesthetic ability.

(2) The correlation analysis results show that children's aesthetic ability has a significant positive correlation with photography education and image cognition ability. The correlation coefficients r are 0.663** and 0.753**, respectively. That is, photography education, image cognition ability, and children's aesthetic ability have a close relationship.

(3) Based on the moderated mediation effect model test, it was found that the interaction term between photography education and the teacher's teaching style has a significant positive predictive effect on children's aesthetic ability ($\beta = 0.31$, $t = 2.68$, $p < 0.01$). The interaction term between image cognition ability and the teacher's teaching style also has a significant predictive effect on children's aesthetic ability ($\beta = -0.4$, $t = -2.51$, $p < 0.05$). This indicates that the teacher's teaching style is an important condition affecting photography education.

In conclusion, this study proposes suggestions for conducting photography education activities to cultivate children's aesthetic ability: First, primary school photography teachers should strengthen their learning of aesthetic concepts related to photography and related art disciplines, and enhance their own aesthetic cultivation. Second, in photography teaching, pay attention to using various carriers, promptly inspire, guide, and stimulate children's aesthetic interest, and enhance their aesthetic perception ability. Third, design more targeted aesthetic teaching contents, such as more classic photography appreciation classes, to enhance children's aesthetic comprehension ability. Fourth, fully mobilize children's enthusiasm, strengthen their active participation, encourage children to practice and create more, and make discovering, feeling, understanding, and creating beauty become children's conscious behaviors.

Ultimately, through learning photography, children will have significant differences in their external manifestations and inner feelings. Specifically, it is manifested in that their aesthetic cognition has improved, their various physical and mental potential has been developed, and their imagination and creativity have been enhanced.

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