

Measures to improve curriculum through analysis of the recognition and demand of education college students on creativity convergence education



Chungyun Kim*

Free Major Department, Sangji University, Wonju, South Korea

ARTICLE INFO

Article history:

Received 16 December 2021

Received in revised form

9 February 2022

Accepted 9 February 2022

Keywords:

Education major

Education college

College student

Creativity convergence competency

Creativity convergence education

ABSTRACT

Recently, a crucial issue of college innovation in Korea is creativity convergence education. Fostering education college students with creativity convergence competency is emerging as an important aspect. However, the current curriculum operation to implement a creativity convergence education for the education of college students is insufficient. Accordingly, an analysis of the recognition and demand of education college students on creativity convergence education was done. A survey was conducted on the recognition and demand of creativity convergence education for 326 education college students, and the differences were compared. As a result of this study, various differences were revealed according to gender, grade, and detailed majors in the education college. These results show that a creativity convergence education should be implemented considering the background variables of education college students and more opportunities for various career paths and choices should be provided. Therefore, it implies that the creativity convergence education that reflects the recognition and demand of education college students should be more actively conducted in the education colleges.

© 2022 The Authors. Published by IASE. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

In preparation for the era of the fourth industrial revolution and the future society, fostering people who are talented in creativity convergence is a nationally necessary task. However, since creativity is the creative potential of all people and can be developed through education (Sternberg and Lubart, 1999), educational interventions at each stage of development are necessary. In addition, as the argument that creativity can be developed through education has been accepted, research on the creativity convergence competency of college students by major fields is being conducted in earnest. In particular, it has been argued that as the career paths of college students in teacher education are diversified, creativity convergence education is provided according to the level of creativity convergence competency, and it is necessary to actively present teaching-learning methods and opportunities for management (Hur, 2016).

Creativity convergence competency is the one that makes convergent values by new convergent thinking that can be applied and applied by understanding, analyzing, and reasoning knowledge and skills in various academic fields with creative ability creative personality, and creative leadership to solve problems creatively (Kim and Lee, 2018). The importance of cultivating people who are talented in creativity convergence to learn humanities and science technology through the development of such creativity convergence competency is emphasized, and effective education is possible only when education based on the characteristics of each grade and major of the college is provided in the education major department. This is because when college students in the education field have to play a role in the field of education after graduating from college, they identify learners' dispositions and characteristics, develop models and programs for creativity convergence education suitable for this, and demonstrate their creativity convergence education, which can improve creativity convergence competency (Klein, 2010).

College students in the education field have not been able to accurately figure out their aptitudes and interests. In many cases, they select a major, consider the rank of the college and grades for the entrance examination, or choose a major while expecting stability in teacher life. However, the

* Corresponding Author.

Email Address: creativity55@sangji.ac.kr<https://doi.org/10.21833/ijaas.2022.04.008>

Corresponding author's ORCID profile:

<https://orcid.org/0000-0003-3145-9319>

2313-626X/© 2022 The Authors. Published by IASE.

This is an open access article under the CC BY-NC-ND license

(<http://creativecommons.org/licenses/by-nc-nd/4.0/>)

number of students who can become teachers after graduating from the College of Education is limited because the competition rate for teaching jobs at public schools is high due to the discrepancy between the demand for teaching positions and the supply of teacher training institutions. Therefore, recognition and demand for creativity convergence education of the students who major in education are analyzed because it is necessary to develop a curriculum so that students who attend the teachers' college can acquire appropriate competencies with interest in various career paths other than the teaching professions (Reynolds et al., 2013). Accordingly, it is possible for teachers' college students to explore possibilities to advance into various fields related to education.

On the other hand, creativity convergence education is used similarly to various concepts such as STEAM education, convergence education, interdisciplinary education, or transdisciplinary education, depending on the researcher or the institution using this concept, without agreement while having common characteristics. Therefore, it is necessary to clearly define creativity convergence education. In response, creativity convergence education to promote creativity convergence competency which is composed of creative ability, creative personality, creative leadership, convergent thinking, and convergent value creation should be provided, while mentioning the importance of creativity convergence education should be implemented (Barnett, 2020).

In order to implement classes and curricula to cultivate people who are talented in creativity convergence, learners' recognition of creativity convergence education should be confirmed, and demands for creativity convergence education should be discussed. This is because creativity convergence education should be learner-centered, and if such education is activated, classes can proceed in which learners can communicate and cooperate with each other. In this regard, the notion that the concept and core competencies of people who are talented in creativity convergence should be analyzed and cognitive and affective aspects should be considered was suggested (Glăveanu et al., 2019). Creativity convergence education should be the one to develop the competency of 5 factors including creative ability, creative personality, creative leadership, convergent thinking, and convergence value creation of college students in higher education. Therefore, in this study, the definition of creativity convergence education from a previous research result (Kim and Lee, 2018) is accepted. This study will help the foundation for practical creativity convergence education to be made, based on the results of analyzing the recognition and demands of university students who attend the teachers' college.

Therefore, in this study, creativity convergence education at a college is defined as education that can enhance college students' creativity convergence competency and an integrated approach in terms of cognitive, affective, and behavioral aspects. The

differences in the recognition and demand of creativity convergence education by background variables of teachers' college students will be analyzed. The research questions were set up as follows:

- Research question 1. What is the difference in recognition and demand for creativity convergence education by gender?
- Research question 2. What is the difference in recognition and demand for creativity convergence education by grade?
- Research question 3. What is the difference in the recognition and demand for creativity convergence education for each specific major?

2. Research method

The subjects were 326 students who attended an education college, 142 males and 184 females. They were 58 freshmen, 76 sophomores, 98 juniors, and 94 seniors. The detailed majors were education 51, Korean education 58, English education 47, mathematics education 49, early childhood education 53, physical education 37, art education 31. The research tool was developed and validated with references such as Mullet et al. (2016), Patston et al. (2018), Rubenstein et al. (2013, 2018) to identify creativity convergence education for developing creativity convergence competency. The response data were statistically processed using SPSS 25.0. An independent sample t-test and one-way ANOVA and *Sheffé* post-test were conducted for the research questions 1, 2, and 3.

3. Research result

There were significant differences by gender, grade, and detailed majors in Tables 1-6.

Table 1: Recognition difference by gender

Sub-factor	Gender	N	M	SD	t	p
Understanding of Creativity	male	142	2.32	1.43	-4.332	.000
Convergence Education	female	184	2.97	1.22		
Interest of Creativity	male	142	3.89	1.17	1.865	.063
Convergence Education	female	184	3.65	1.14		
Demand for Creativity	male	142	4.16	0.99	1.169	.243
Convergence Education	female	184	4.04	0.92		
Whether Creativity Convergence Education Helps Career Development	male	142	4.11	1.12	.318	.751
	female	184	4.08	0.90		
Total of recognition	male	142	14.48	3.55	-6.72	.502
	female	184	14.73	3.14		

In Table 1, the difference between the two groups of male students and females was statistically significant in the understanding of creativity convergence education (p<.05), but there was no significant difference between boys and girls in the total recognition (p.>.05).

In Table 2, the average score for the demand of males was high in imagination, challenge spirit, task attachment, creative thinking, and convergent value

creation, and the difference between the two groups was statistically significant ($p < .05$).

Table 2: Demand difference by gender

Sub-factor	Gender	N	M	SD	t	p
Imagination	male	142	4.18	1.16	1.950	.049
	female	184	3.91	1.28		
Flexibility	male	142	4.00	1.02	-.923	.357
	female	184	4.10	0.99		
Insight	male	142	4.12	1.01	.850	.396
	female	184	4.02	1.05		
Challenge spirit	male	142	3.88	1.16	2.452	.015
	female	184	3.54	1.32		
Task attachment	male	142	4.13	1.17	3.217	.001
	female	184	3.73	1.03		
Learning motivation	male	142	3.85	1.22	.065	.948
	female	184	3.84	1.04		
Creative thinking	male	142	4.22	1.11	3.727	.000
	female	184	3.74	1.20		
Problem solving ability	male	142	4.18	1.02	.287	.774
	female	184	4.15	0.92		
Empathy	male	142	4.01	1.11	.250	.803
	female	184	3.98	1.07		
Communication skill	male	142	4.02	1.27	1.137	.257
	female	184	3.87	1.13		
Collaboration	male	142	4.07	1.22	1.456	.146
	female	184	3.89	1.00		
Self-directedness	male	142	3.39	1.53	.780	.436
	female	184	3.26	1.35		
Convergent thinking	male	142	3.66	1.66	-.006	.995
	female	184	3.66	1.44		
Convergent value creation	male	142	4.30	1.18	2.990	.003
	female	184	3.90	1.20		
Emotional experience	male	142	3.86	1.21	-.885	.377
	female	184	3.97	1.10		
Self-reflection	male	142	3.27	1.63	.251	.802
	female	184	3.22	1.57		
Total of demand	male	142	63.13	14.00	1.634	.103
	female	184	60.80	11.71		

In Table 3, except for the understanding of creativity convergence education, statistically significant differences were found between grades in all sub-factors and the total recognition of creativity

convergence education ($p < .001$). In the total recognition of creativity convergence education, the difference between 1, 2, 3, and 4th graders was statistically significant ($p < .001$).

Table 3: Recognition difference by grade

Sub-factor	Grade	N	M	SD	SS	df	MS	F	p	Scheffé
Understanding of Creativity Convergence Education	1	58	2.67	1.03	.195	3	.065	.035	.991	
	2	76	2.64	1.60						
	3	98	2.70	1.22						
	4	94	2.70	1.47						
	Total	326	2.68	1.35						596.457
Interest of Creativity Convergence Education	1	58	3.03	1.35	52.487	3	17.496	14.656	.000	
	2	76	3.66	1.24						
	3	98	3.79	1.04						
	4	94	4.23	0.81						
	Total	326	3.75	1.16						436.874
Demand for Creativity Convergence Education	1	58	3.69	1.17	16.645	3	5.548	6.459	.000	
	2	76	4.03	1.14						
	3	98	4.12	0.80						
	4	94	4.36	0.64						
	Total	326	4.09	0.95						293.239
Whether Creativity Convergence Education Helps Career Development	1	58	3.79	1.18	18.490	3	6.163	6.470	.000	
	2	76	3.86	1.30						
	3	98	4.16	0.81						
	4	94	4.39	0.63						
	Total	326	4.09	1.00						325.239
Total of recognition	1	58	13.19	3.73	243.385	3	81.128	7.823	.000	
	2	76	14.18	4.41						
	3	98	14.78	2.46						
	4	94	15.69	2.32						
	Total	326	14.62	3.32						3582.834

In Table 4, statistically significant differences were found between majors in all sub-factors and the total recognition of creativity convergence education, except for 2 sub-factors. ($p < .05$). In the

total recognition of creativity convergence education, the difference in average scores between physical education and other majors was statistically significant ($p < .05$).

Table 4: Demand difference by grade

Sub-factor	grade	N	M	SD	SS	df	MS	F	p	Scheffé					
Imagination	1	58	3.38	1.35	56.668	3	18.889	13.788	.000						
	2	76	3.88	1.51											
	3	98	3.97	1.04							441.136	322	1.370		
	4	94	4.60	0.81							497.804	325			4 >
	Total	326	4.02	1.24											3 >
Flexibility	1	58	4.17	0.80	6.778	3	2.259	2.280	.079						
	2	76	4.00	1.06											
	3	98	3.88	1.07							319.115	322	.991		
	4	94	4.22	0.97							325.893	325			1,2
	Total	326	4.06	1.00											
Insight	1	58	3.90	0.93	8.178	3	2.726	2.601	.062						
	2	76	4.12	1.11											
	3	98	3.92	1.03							337.469	322	1.048		
	4	94	4.28	1.00							345.647	325			
	Total	326	4.06	1.03											
Challenge spirit	1	58	3.34	1.45	23.297	3	7.766	5.078	.002						
	2	76	3.68	1.15											
	3	98	3.53	1.33							492.411	322	1.529		
	4	94	4.07	1.06							515.709	325			4 >
	Total	326	3.69	1.26											1,2,3
Task attachment	1	58	3.48	1.05	22.289	3	7.430	6.333	.000						
	2	76	3.86	1.21											
	3	98	3.86	1.03							377.763	322	1.173		
	4	94	4.26	1.06							400.052	325			2,3,4 >
	Total	326	3.90	1.11											1
Learning motivation	1	58	3.72	0.93	12.733	3	4.244	3.478	.016						
	2	76	3.63	1.26											
	3	98	3.79	1.11							392.973	322	1.220		
	4	94	4.14	1.06							405.706	325			1 >
	Total	326	3.84	1.12											2,3,4
Creative thinking	1	58	3.62	1.30	41.358	3	13.786	10.703	.000						
	2	76	3.80	1.32											
	3	98	3.72	1.12							414.756	322	1.288		
	4	94	4.50	0.85							456.113	325			4 >
	Total	326	3.95	1.18											1,2,3
Problem solving ability	1	58	3.84	1.07	8.662	3	2.887	3.180	.024						
	2	76	4.26	0.75											
	3	98	4.14	1.02							292.393	322	.908		
	4	94	4.31	0.95							301.055	325			4 >
	Total	326	4.17	0.96											1,2,3
Empathy	1	58	4.26	0.89	8.933	3	2.978	2.550	.066						
	2	76	3.79	1.16											
	3	98	3.91	1.10							376.064	322	1.168		
	4	94	4.10	1.10							384.997	325			
	Total	326	4.00	1.09											
Communication skill	1	58	3.83	1.05	18.175	3	6.058	4.379	.005						
	2	76	3.64	1.37											
	3	98	3.90	1.17							445.472	322	1.383		
	4	94	4.28	1.08							463.647	325			4 >
	Total	326	3.94	1.19											1,2,3
Collaboration	1	58	3.98	1.05	2.917	3	.972	.797	.496						
	2	76	3.87	1.17							392.777	322	1.220		

	3	98	3.91	1.07							
	4	94	4.11	1.12							
	Total	326	3.97	1.10	395.693	325					
	1	58	3.45	1.17	32.212	3	10.737	5.486	.001		
	2	76	3.18	1.49							
Self-directedness	3	98	3.71	1.04	630.245	322	1.957				2,3,4 > 1
	4	94	2.93	1.74							
	Total	326	3.32	1.43	662.457	325					
	1	58	3.62	1.23	46.582	3	15.527	6.922	.000		
	2	76	3.70	1.65							
Convergent thinking	3	98	4.14	0.99	722.301	322	2.243				2,3,4 > 1
	4	94	3.16	1.90							
	Total	326	3.66	1.54	768.883	325					
	1	58	4.03	1.12	10.111	3	3.370	2.333	.074		
	2	76	3.96	1.34							
Convergent value creation	3	98	3.92	1.15	465.266	322	1.445				
	4	94	4.34	1.18							
	Total	326	4.07	1.21	475.377	325					
	1	58	4.02	0.78	1.236	3	.412	.310	.818		
	2	76	3.87	1.37							
Emotional experience	3	98	3.87	1.16	427.847	322	1.329				
	4	94	3.97	1.14							
	Total	326	3.92	1.15	429.083	325					
	1	58	2.83	1.43	31.313	3	10.438	4.241	.006		
	2	76	3.11	1.73							
Self-reflection	3	98	3.68	1.27	792.543	322	2.461				2,3,4 > 1
	4	94	3.15	1.78							
	Total	326	3.24	1.59	823.856	325					
	1	58	59.48	11.85	1102.555	3	367.518	2.273	.080		
	2	76	60.36	13.11							
Total of demand	3	98	61.85	12.80	52057.031	322	161.668				
	4	94	64.39	12.82							
	Total	326	61.81	12.79	53159.586	325					

In Table 5, statistically significant differences were found between majors in all sub-factors and the total recognition of creativity convergence education, except for 2 sub-factors. (p<.05). There was a statistically significant difference between early childhood education and other majors in the

understanding of creativity convergence education (p<.05). In the total recognition of creativity convergence education, the difference in average scores between physical education and other majors was statistically significant (p<.05).

Table 5: Recognition difference by major

Sub-factor	Major	N	M	SD	SS	df	MS	F	p	Scheffé
Understanding of Creativity Convergence Education	1	51	2.25	1.18						
	2	58	2.55	1.54	66.817	6	11.136	6.707	.000	
	3	47	2.00	1.59						
	4	49	2.73	0.97						5 >
	5	53	3.36	1.33	529.640	319	1.660			1,2,3,4,6,7
	6	37	3.19	0.94						
	7	31	2.84	1.16	596.457	325				
	Total	326	2.68	1.35						
Interest of Creativity Convergence Education	1	51	3.39	1.20						
	2	58	4.00	1.18	25.675	6	4.279	3.320	.003	
	3	47	4.06	1.21						
	4	49	3.35	1.49						3 >
	5	53	3.68	1.03	411.199	319	1.289			1,2,4,5,6,7
	6	37	3.95	0.70						
	7	31	3.90	0.65	436.874	325				
	Total	326	3.75	1.16						
Demand for Creativity Convergence Education	1	51	3.92	1.09						
	2	58	4.26	0.97	3.499	6	.583	.642	.696	
	3	47	4.13	1.08						
	4	49	4.04	1.00						
	5	53	4.06	0.89	289.740	319	.908			
	6	37	4.08	0.72						
	7	31	4.16	0.73	293.239	325				
	Total	326	4.09	0.95						
Whether Creativity Convergence Education Helps Career Development	1	51	3.71	1.33						
	2	58	4.28	0.97	11.606	6	1.934	1.967	.070	

	3	47	4.19	1.12					
	4	49	4.10	1.01					
	5	53	4.02	0.84	313.633	319	.983		
	6	37	4.14	0.71					
	7	31	4.29	0.59					
	Total	326	4.09	1.00	325.239	325			
Total of recognition	1	51	13.27	3.78					
	2	58	15.10	3.46	159.069	6	26.512	2.470	.024
	3	47	14.38	3.88					
	4	49	14.22	3.28					
	5	53	15.11	3.21	3423.765	319	10.733		
	6	37	15.35	2.18					
	7	31	15.19	1.94					
	Total	326	14.62	3.32	3582.834	325			

* 1: Education, 2: Korean education, 3: English education, 4: mathematics education, 5: Early childhood education, 6: Physical education, 7: Art education

In Table 6, statistically significant differences were found between majors in all sub-factors and total demands except for emotional experience (p<.05). These results show that there is a high

demand for college students in the education field to develop creativity and create convergent values through empathy and collaboration through team activities.

Table 6: Demand difference by major

Sub-factor	Major	N	M	SD	SS	df	MS	F	p	Scheffé
Imagination	1	51	3.92	1.31						
	2	58	4.40	0.88	25.495	6	4.249	2.870	.010	
	3	47	4.38	1.17						
	4	49	3.59	1.37						
	5	53	3.87	1.13	472.309	319	1.481			4 > 1,2,3,5,6,7
	6	37	3.92	1.57						
	7	31	4.03	1.08	497.804	325				
	Total	326	4.02	1.24						
Flexibility	1	51	3.80	0.87						
	2	58	4.05	1.02	23.580	6	3.930	4.147	.000	
	3	47	4.34	1.05						
	4	49	4.53	0.96						
	5	53	3.75	1.16	302.312	319	.948			6 > 1,2,3,4,5,7
	6	37	3.95	0.88						
	7	31	3.97	0.66	325.893	325				
	Total	326	4.06	1.00						
Insight	1	51	4.20	0.96						
	2	58	4.03	0.99	21.120	6	3.520	3.460	.003	
	3	47	4.21	1.02						
	4	49	3.80	1.12						
	5	53	3.68	1.14	324.528	319	1.017			6 > 1,2,3,4,5,7
	6	37	4.49	0.90						
	7	31	4.26	0.77	345.647	325				
	Total	326	4.06	1.03						
Challenge spirit	1	51	3.75	1.02						
	2	58	3.88	1.26	70.781	6	11.797	8.458	.000	
	3	47	4.19	1.08						
	4	49	2.71	1.76						
	5	53	3.47	1.03	444.927	319	1.395			1,2,3,6,7 > 4,5
	6	37	3.95	0.91						
	7	31	4.10	0.75	515.709	325				
	Total	326	3.69	1.26						
Task attachment	1	51	3.80	1.31						
	2	58	4.33	0.98	30.529	6	5.088	4.393	.000	
	3	47	4.30	1.14						
	4	49	3.55	1.08						
	5	53	3.57	1.12	369.523	319	1.158			
	6	37	3.84	0.90						
	7	31	3.90	0.79	400.052	325				
	Total	326	3.90	1.11						
Learning motivation	1	51	3.59	0.98						
	2	58	3.84	1.39	20.952	6	3.492	2.895	.009	
	3	47	4.30	1.12						
	4	49	3.80	1.14						
	5	53	3.51	1.14	384.754	319	1.206			
	6	37	3.95	0.85						
	7	31	4.06	0.68	405.706	325				
	Total	326	3.84	1.12						

	1	51	4.24	0.86						
	2	58	4.12	1.27	58.093	6	9.682	7.760	.000	
	3	47	4.45	1.04						
Creative thinking	4	49	3.14	1.54	398.020	319	1.248			1,2,3,7 > 4,5,6
	5	53	3.60	1.10						
	6	37	3.97	0.87						
	7	31	4.23	0.72						
	Total	326	3.95	1.18						
	1	51	3.90	0.81						
	2	58	4.41	1.03						
	2	58	4.41	1.03	20.069	6	3.345	3.797	.001	
	3	47	4.32	1.07						
Problem solving ability	4	49	3.76	1.05	280.986	319	.881			
	5	53	4.34	0.85						
	6	37	4.05	0.91						
	7	31	4.39	0.72						
	Total	326	4.17	0.96						
	1	51	3.90	0.83						
	2	58	4.19	1.18						
	2	58	4.19	1.18	39.692	6	6.615	6.111	.000	
	3	47	3.81	1.35						
Empathy	4	49	4.65	0.72	345.304	319	1.082			4 > 1,2,3,5,6,7
	5	53	3.53	1.19						
	6	37	3.76	0.95						
	7	31	4.13	0.76						
	Total	326	4.00	1.09						
	1	51	3.49	1.32						
	2	58	4.28	1.14						
	2	58	4.28	1.14	22.495	6	3.749	2.711	.014	
	3	47	4.00	1.44						
Communication skill	4	49	3.92	1.17	441.152	319	1.383			
	5	53	3.72	1.13						
	6	37	4.03	0.90						
	7	31	4.23	0.88						
	Total	326	3.94	1.19						
	1	51	3.80	1.40						
	2	58	4.40	0.90						
	2	58	4.40	0.90	28.523	6	4.754	4.130	.001	
	3	47	3.94	1.26						
Collaboration	4	49	4.00	0.98	367.170	319	1.151			2 > 1,3,4,5,6,7
	5	53	3.45	1.03						
	6	37	4.05	0.91						
	7	31	4.23	0.80						
	Total	326	3.97	1.10						
	1	51	2.88	1.57						
	2	58	3.53	1.49						
	2	58	3.53	1.49	33.210	6	5.535	2.806	.011	
	3	47	3.51	1.56						
Self-directedness	4	49	3.49	1.17	629.247	319	1.973			
	5	53	2.91	1.38						
	6	37	3.24	1.44						
	7	31	3.84	0.97						
	Total	326	3.32	1.43						
	1	51	3.10	1.72						
	2	58	3.86	1.61						
	2	58	3.86	1.61	30.606	6	5.101	2.204	.042	
	3	47	3.72	1.75						
Convergent thinking	4	49	3.65	1.07	738.278	319	2.314			7 > 1,2,3,4,5,6
	5	53	3.55	1.54						
	6	37	3.73	1.61						
	7	31	4.26	1.00						
	Total	326	3.66	1.54						
	1	51	3.98	1.39						
	2	58	4.59	0.86						
	2	58	4.59	0.86	57.140	6	9.523	7.264	.000	
	3	47	4.45	1.08						
Convergent value creation	4	49	4.06	0.99	418.238	319	1.311			2 > 3,7 > 1,4,5,6
	5	53	3.70	1.12						
	6	37	3.24	1.61						
	7	31	4.32	0.83						
	Total	326	4.07	1.21						
	1	51	3.75	1.25						
	2	58	3.90	1.12						
	2	58	3.90	1.12	8.036	6	1.339	1.015	.416	
	3	47	4.06	1.34						
Emotional experience	4	49	4.16	1.07	421.047	319	1.320			

	5	53	3.72	1.20					
	6	37	3.92	1.04					
	7	31	4.03	0.84	429.083	325			
	Total	326	3.92	1.15					
	1	51	2.98	1.57					
	2	58	3.19	1.63	86.246	6	14.374	6.217	.000
	3	47	3.40	1.77					
Self-reflection	4	49	2.37	1.09					
	5	53	3.25	1.73	737.610	319	2.312		7 > 6 > 1,2,3,4,5
	6	37	3.76	1.57					
	7	31	4.29	0.78	823.856	325			
	Total	326	3.24	1.59					
	1	51	59.08	12.82					
	2	58	65.00	12.12	3459.805	6	576.634	3.701	.001
	3	47	65.38	15.18					
Total of demand	4	49	59.18	12.23					7 >
	5	53	57.60	11.87	49699.781	319	155.799		2,3 >
	6	37	61.84	12.11					1,4,5,6
	7	31	66.26	9.52	53159.586	325			
	Total	326	61.81	12.79					

* 1: Education, 2: Korean education, 3: English education, 4: mathematics education, 5: Early childhood education, 6: Physical education, 7: Art education

4. Discussion

In this study, the recognition and demand for creativity convergence education were analyzed for teachers' college students at four-year universities nationwide.

First, there was no significant difference in gender recognition and demand. Both males and females were aware of creativity convergence education, and there was no difference in demand level. In the light of the result that the percentage of female students passed 76.9% as a result of the secondary school teacher exam in 2019, it can be speculated that in many cases male students are working in other fields rather than working as a teacher. In addition, it is necessary to educate college students in the teaching field to work in various fields after graduation through the capstone design classes (Custodero, 2015). In order to be able to solve problems and to give learners a positive self-concept of their performance, there should be support and efforts from teachers in the teacher's field (Lee, 2017).

Second, the fact that there was a difference in recognition of teachers' college students by grade indicates that the degree of awareness of creativity convergence education was low, especially in the first grade. This is because the higher the grade, the more recognition of creativity convergence through taking major courses, comparison, and various activities, and through this kind of academic experience, the importance of creativity convergence education is recognized. On the other hand, when it comes to the demand for creativity convergence education, although the level of the higher grades is high, the difference is not significant for each grade. This suggests that students should increase their interest in various fields as well as their own major field (Lee and Yang, 2017). However, STEAM education is provided only in some subjects in the teacher department, and it is composed of individually disconnected subjects. Therefore, there

is a need to promote creativity convergence competency through multi-year or multi-disciplinary project activities by creating integrated courses that enable convergent thinking using knowledge and information separated by disciplines.

Third, there were differences in the recognition and demand of creativity convergence education by majors. The level of understanding of creativity convergence education is relatively low. It is similar to the result that all of the students, regardless of their majors, are aware of the creativity convergence education, and that there is a need to prepare for changes in the future society or to increase insufficient competencies (Kim, 2021). It is necessary to develop and share a creativity convergence curriculum or many convergence capstone design classes through an understanding and consensus on the value of the creativity convergence education of teachers' college members, breaking down the walls of division and high boundaries between disciplines. This suggests that the competency of the instructors to be able to effectively implement the program should be developed. This study is significant in that it provides important basic data for constructing effective creativity convergence education programs for each background variable of teachers' college students in the future.

Compliance with ethical standards

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

- Barnett R (2020). Towards the creative university: Five forms of creativity and beyond. *Higher Education Quarterly*, 74(1): 5-18. <https://doi.org/10.1111/hequ.12231>

- Custodero LA (2015). Ubiquitous creativity, imagination in dialogue, and innovative practice-in-action. *Teachers College Record*, 117(10): 1–10.
<https://doi.org/10.1177/016146811511701010>
- Glăveanu V and Kaufman J (2019). Creativity: A Historical Perspective. In *The Cambridge Handbook of Creativity*, edited by J. Kaufman and R. Sternberg, 9–26. Cambridge University Press, Cambridge, UK.
<https://doi.org/10.1017/9781316979839.003>
- Hur YJ (2016). The impact of the creative atmosphere of a group and individual motivation on a university student's creative personality. *Asia-Pacific Journal of Educational Management Research*, 1(1): 23-28.
<https://doi.org/10.21742/ajemr.2016.1.1.04>
- Kim CY (2021). Verification of differences in the improvement of college students' creativity convergence competency and problem solving ability according to the application of creativity convergence class using design thinking process. *Review of International Geographical Education*, 11(7): 1934-1944.
- Kim CY, and Lee KY (2018). Development and validation of a creativity convergence competency test for university students. *Asia Life Sciences*, 15(4): 2743-2753.
- Klein JT (2010). A taxonomy of interdisciplinarity. In: Frodeman R, Klein JT, and Pacheco RCDS (Eds.), *The Oxford handbook of interdisciplinarity*: 15-30. Oxford University Press, Oxford, UK.
- Lee M and Yang A (2017). The structural relationships among creative learning self-efficacy, academic adaptation, and career maturity of aeronautics students. *Asia-pacific Journal of Education*, 2(1): 161-168.
<https://doi.org/10.21742/ajemr.2017.2.1.27>
- Lee SY (2017). Importance-performance analysis of museum instructors core teaching competencies. *International Journal of Art and Culture Technology*, 1: 13-18.
<https://doi.org/10.21742/ijact.2017.1.2.03>
- Mullet DR, Willerson A, Lamb KN, and Kettler T (2016). Examining teacher perceptions of creativity: A systematic review of the literature. *Thinking Skills and Creativity*, 21: 9–30.
<https://doi.org/10.1016/j.tsc.2016.05.001>
- Patston TJ, Cropley DH, Marrone RL, and Kaufman JC. (2018). Teacher implicit beliefs of creativity: Is there an arts bias? *Teaching and Teacher Education*, 75: 366–374.
<https://doi.org/10.1016/j.tate.2018.08.001>
- Reynolds C, Stevens DD and West E (2013). I'm in a professional school! Why are you making me do this? A cross-disciplinary study of the use of creative classroom projects on student learning. *College Teaching*, 61(2): 51-59.
<https://doi.org/10.1080/87567555.2012.731660>
- Rubenstein LD, McCoach DB, and Siegle D (2013). Teaching for creativity scales: An instrument to examine teachers' perceptions of factors that allow for the teaching of creativity. *Creativity Research Journal*, 25(3): 324–334.
<https://doi.org/10.1080/10400419.2013.813807>
- Rubenstein LD, Ridgley LM, Callan GL, Karami S, and Ehlinger J (2018). How teachers perceive factors that influence creativity development: Applying a social cognitive theory perspective. *Teaching and Teacher Education*, 70: 100–110.
<https://doi.org/10.1016/j.tate.2017.11.012>
- Sternberg RJ and Lubart TI (1999). The concept of creativity: Prospects and paradigms. In: Sternberg RJ (Ed.), *Handbook of creativity*: 3-15. Cambridge University Press, Cambridge, UK.
<https://doi.org/10.1017/CBO9780511807916.003>