Q-Methodology: A New Way to Develop an Effective Teaching Model for the Development of Students' Creative Activity

Bui Thi Le Thuy, Kazarenkov Vyacheslav Ilyich

Abstract: ***In this study a Q-methodology was used to find out the factors that influence students' creative activity development. A sample of 94 Vietnamese teachers and students was recruited to participate in the present study. We used a Q-sample of 56 statements and a Q-grid with an 11-point scale. Data analysis was performed by using a web application – Ken-Q Analysis version 1.0.6. Factors were extracted by using principal components and varimax method. Research results showed that there were two factors influencing students' creative activity development: Factor I – the teachers' teaching activity and factor II – the students themselves. Factor I had an eigenvalue of 46.6 which accounted for 50% of the study's variance, contains 64 respondents who had significance loading on this factor. Factor II had an eigenvalue of 7.24 which accounted for 8% of the study's variance, contains 30 respondents who had significance loading on this factor. Based on the research results obtained, we proceed to build an effective teaching model for developing the creative activity of students. In this model, each factor consists of many specific elements with different scores (from -5 to +5). The model includes focal and corrective elements. The findings of this study indicate that for achieving creative goals of the teaching process it requires efforts from both teachers and students themselves. This model is a useful tool that can help clear orientation for teachers and students. It can be applied in the teaching process at universities to improve creative activity for students. This article is considered the first study using Q-methodology to study an effective teaching model for developing students' creativity.***

Keywords : Effective teaching model, creative activity, Q-methodology, development, Vietnamese teacher and student.

I. INTRODUCTION

Students' personality is formed and developed in the learning process. Creative activity in the learning process is defined as "a form of human activity aimed at creating qualitatively new for him values that have social significance, that is, important for the formation of personality as a social subject" [35]. The central task of every modern school is to focus on developing creative personalities for students. This is also an urgent need for the development of every nation.

Students' creative activity has also attracted the attention of scientific researchers in the world. Different aspects of creativity has been studied as Nature and characteristics of creativity [22], [23]; Formation of students' creativity [20]; Creativity in education [30], [26], [28], [13]; The relationship between creativity and other factors such as intelligence, academic achievement, environment, thinking, personality characteristics [24], [8] , [33], [25], [14]; Factors influencing creative teaching [9], [4]; Learning Environments that support Student Creativity [5], [21], [15], [11], [2]; The Assessment of Creative Learning [6].

Currently, the use of the Q-method is significantly increasing in research in the field of sociology [32], [12]; Rural sciences [19]; Policy sciences [34], [17], [16]; Psychological sciences [31]. In recent years studies using Q-methodology began to appear popular in the field of education. For example, a variety of issues such as geographical and pedagogical research [18]); Subjective issues in educational research [29]; Learning process [7], [10] was conducted by the application of Q-methodology.

However, there is limited research on studying students' creative activity using Q-methodology. In this paper, by using Q methodology, we conduct to build an effective teaching model that develops students' creative activity based on discovering the perspectives of both Vietnamese teachers and students.

II. RESEARCH METHOD

Q-methodology was used to build an effective teaching model for the development of students' creative activity using a web application - Ken-Q Analysis version 1.0.6 [1] (https://shawnbanasick.github.io/ken-q-analysis). In the first step of this study, we created a final Q-sample consisting of 56 statements. The next, thirty-one Vietnamese teachers and sixty-three Vietnamese students were recruited from different faculties at two universities in Vietnam and Russia: Hanoi National University of Education and Peoples' Friendship University of Russia. The statements of the Q-sample are randomly numbered and printed on cards. Participants were then asked to sort these cards into Q-grid according to printed instructions (this process is known as Q-sorting).

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In this study, the Q-grid includes an 11-point scale (-5, -4, -3, -2, -1, 0, +1, +2, +3, +4, +5) (see Fig 1 and 2). The final step of the study is factor analysis and interpretation, which is considered to be the most complex and important step. The data obtained were analyzed by using the principal components and varimax method.

Table- I: Factor Loadings of Respondents Performing Q-Sorting

Participant	Factor loadings		Participant	Factor loadings	
	Factor I	Factor II		Factor I	Factor II
1	0.351x	0.223	48	0.6872x	0.2867
2	0.7969x	0.2689	49	0.7204x	0.1683
3	0.6715x	0.3504x	50	0.5742x	0.4539x
4	0.6227x	0.456x	51	0.8662x	0.1656
5	0.4754x	0.4963x	52	0.5643x	0.3366
6	0.6853x	0.3874x	53	0.7172x	0.2876
7	0.5799x	0.149	54	0.5179x	0.1705
8	0.4981x	0.5184x	55	0.1785	0.5248x
9	0.6595x	0.3975	56	0.5329x	0.0046
10	0.6873x	0.0798	57	0.6565x	0.5876x
11	0.7714x	0.1569	58	0.2286	0.4313x
12	0.7016x	0.4024x	59	0.6735x	0.3283
13	0.7065x	0.2967	60	0.5422x	0.5324x
14	0.6696x	0.3505x	61	0.6696x	0.3505x
15	0.4961x	0.4128	62	0.4867x	0.4104x
16	0.7714x	0.1569	63	0.7701x	0.3304
17	0.6518x	0.3594x	64	0.5445x	0.4182x
18	0.7472x	0.3476x	65	0.6413x	0.2408
19	0.368x	0.467x	66	0.6452x	0.4517x
20	0.7487x	0.1931	67	0.5855x	0.4013x
21	0.6739x	0.4306x	68	0.6259x	0.3651x
22	0.4181x	0.2566	69	0.7041x	0.3595x
23	0.5375x	0.4157x	70	0.6739x	0.4306x
24	0.4912x	0.1223	71	0.4985x	0.5897x
25	0.6077x	0.3967x	72	0.7041x	0.3595x
26	0.583x	0.2467	73	0.3574x	0.7875x
27	0.6199x	0.268	74	-0.1353	0.7002x
28	0.7041x	0.3595x	75	0.346x	0.8606x
29	0.7071x	0.3143	76	0.0151	0.501x
30	0.5375x	0.4157x	77	0.3258	0.8436x
31	0.7953x	0.3636x	78	0.3587x	0.8448x
32	0.7968x	0.2812	79	0.269	0.7146x
33	0.481x	0.2171	80	0.2178	0.8176x
34	0.585x	0.2476	81	0.367x	0.7979x
35	0.7452x	0.3945x	82	0.393x	0.7605x
36	0.7806x	0.2892	83	0.2219	0.7503x
37	0.777x	0.1437	84	0.2856	0.8119x
38	0.7552x	0.0991	85	0.3781x	0.797x
39	0.8111x	0.3511x	86	0.3341	0.8459x
40	0.708x	0.0342	87	0.364x	0.8191x
41	0.1068	0.4744x	88	0.2028	0.7622x
42	0.7691x	0.3409x	89	0.301	0.7393x
43	0.4989x	0.3991x	90	0.3356	0.8311x
44	0.6766x	0.2811	91	0.3743x	0.834x
45	0.5035x	0.3952x	92	0.3364	0.871x
46	0.6573x	0.191	93	0.434x	0.8185x
47	0.1068	0.4744x	94	0.4095x	0.8606x

X: indicates a significance factor loading of respondents on one factor.

III. RESULT AND DISSCUSSION

A total of 94 participants completed Q-sorting and were included in the factor analysis. There were two factors extracted which accounted for 58% of the study variance. The analysis result obtained was presented in Table I. Participants with a significant loading on a factor define that factor.

The significance (at $p<0.01$) of the loading is calculated by the following formula: $2.58/\sqrt{n}$, where n – number of statements in Q-sample [27]. In this study, 56 statements were used, therefore, the formula becomes: $2.58/\sqrt{56} = 0.34$. The loading of each participant is statistically significant (≥ 0.34) on factor 1 or factor 2 or both.

Table I shows that 34 respondents significantly loaded on factor I; 16 respondents – factor II; 44 respondents – both factors I and II. For example, respondent II correlates 0.7969 with factor I. Student 41 correlates 0.4744 with factor II. Student 4 correlates 0.6227 with factor I and 0.456 with factor II.

Table – II: The Statements and Their Corresponding Ranking (Factor Scores) for Each Factor (-5 to 5)

#	Statement	Factor I	Factor II
1	Knowledge of the discipline is easy to understand and remember	-1[b]	-2[b]
2	Democratic culture in the assessment, consideration of opinions	-1[b]	2[b]
3	The teacher sets the standards for creative requirements in the learning process	-2[b]	2[b]
4	The student has creative knowledge, skills and experience	3[b]	0[b]
5	The teacher has a high academic degree	-3[a]	-2[a]
6	The teacher does not use active methods in the learning process	-3[b]	-4[b]
7	The teacher rarely uses teaching tools to promote student creativity in the learning process.	-4	-4
8	The classroom did not have enough equipment to support creative activity.	-3	-3
9	The university has a policy of encouraging the creativity of students and teachers.	2[b]	-1[b]
10	Learning tasks are very complex and difficult	-2[a]	-2[a]
11	In assessing learning results, the teacher highly appreciates new, unique and useful products.	1[b]	3[b]
12	Discipline has interesting, necessary knowledge.	2[b]	0[b]
13	The teacher has an attractive appearance	-4[a]	-3[a]
14	The student has a confident, risky character and the courage to accept defeat	3[b]	1[b]
15	The teacher uses fun elements in teaching.	-1[b]	3[b]
16	Learning activities do not stimulate the imagination, curiosity of students	-4	-4
17	Student's family highly appreciates creativity in everyday life	2[b]	-1[b]
18	The teacher is ready to support the creative process of students during classes	2[b]	5[b]
19	The student has attention and effort in the learning process.	1	1
20	Teaching activity of teachers creates motivation for students creativity	3[b]	5[b]
21	The student has friends in the group who have creative thinking.	-1[b]	-2[b]
22	University usually organizes creative experience activities	2[b]	-1[b]
23	The student can participate in many activities in the group	1[b]	3[b]
24	The student has a need to develop creative competence in the learning process	4[b]	2[b]
25	There is no learning consciousness in the class: students are often late, do not actively cooperate with teachers and other students in the group.	-5[b]	-4[b]
26	The teacher has observation, satisfaction the various needs of students in the group	0[b]	4[b]
27	The arrangement of tables and chairs is suitable for carrying out a variety of activities in the classroom	-2[b]	0[b]
28	The teacher guarantees temperature, lighting in the classroom	-3[b]	-1[b]

[a]significant distinguishing statement at p <0.05; [b]significant distinguishing statement at p <0.01.

A factor score is a score for a statement as a "kind of average" of the scores given that statement by all of the Q-sorts associated with the factor [3]. In Q methodology, factor interpretations are primarily based on the factor scores. The name of two factors is identified according to the names of statements with high factor scores (-3, -4, -5, +3, +4, +5).

In this study, we explored the opinions of Vietnamese teachers and students about the factors in the development of students' creative activity. The result showed that there are two factors influencing the development of students' creative activity: Factor I - the students themselves and Factor II - the teachers' teaching activity. In accordance with the Q-methodology, specific results are shown in figures I and II.

A. Factor I - Students Themselves

Factor I had eigenvalues 46.6 which accounted for 50% of the study's variance, contains 64 respondents who had significance loading on this factor. In factor I, Vietnamese teachers and students viewed a high level of agreement or disagreement with the following statements: "The student has a positive attitude, interest in creative activity" (36: +5); "The student has curiosity and active awareness" (41: +5); "Student has internal motivation for creativity" (53: +4); "Students have confidence in their creativity" (33: +4); "The student has a need to develop creative competence in the learning process" (24: +4); "Student has creative thinking and creative habit" (44: +4); "The student has a confident, risky character and the courage to accept defeat" (14: +3); "The student has creative knowledge, skills and experience" (04: +3); "There is no learning consciousness in the class: students are often late, do not actively cooperate with teachers and other students in the group." (25: -5).

Table – II: The Statements and Their Corresponding Ranking (Factor Scores) for Each Factor (-5 to 5) (continued)

#	Statement	Factor I	Factor II
29	The teacher and students have a positive relationship in the learning process	1[b]	4[b]
30	Students' high intelligence leads to high creative abilities	-1[b]	0[b]
31	The teacher is a model example of creativity	0[b]	4[b]
32	The university has creative clubs	1[b]	-1[b]
33	Students have confidence in their creativity	4[b]	2[b]
34	The teacher refuses to answer students' questions outside of class time	-5	-5
35	The teacher has awards for students who have creative achievements	1	0
36	The student has a positive attitude, interest in creative activity	5[b]	1[b]
37	The teacher provides fairness and objectivity in the assessment of students	0[b]	2[b]
38	Combining the assessment of teachers and students in the learning process	0	0
39	The content of the discipline includes many practical exercises	0[b]	-2[b]
40	Style of leadership, management and organization of classes teachers	0[b]	4[b]
41	The student has curiosity and active awareness	5[b]	1[b]
42	Students are stimulated to new ideas.	3	3
43	The teacher does not use group forms of teaching	-4[a]	-5[a]
44	Student has creative thinking and creative habit.	4[b]	0[b]
45	The student has independence in solving learning tasks	2[b]	1[b]
46	The teacher who has studied abroad	-2	-3
47	The teacher allows students to solve learning problems in their own way	3	3
48	In a collective has a collaborative, friendly psychological atmosphere.	1[b]	2[b]
49	The student lives in a creative collective	0[b]	-3[b]
50	The health status of students in the group	-2[b]	0[b]
51	The psychological atmosphere of a group of students in the process of interaction	0[b]	1[b]
52	The number of students in the class is small (≤ 50 students)	-2[b]	-1[b]
53	Student has internal motivation for creativity	4[b]	1[b]
54	The economic condition of the student family	-3[a]	-3[a]
55	Student lives in a family with a democratic atmosphere	-1[b]	-2[b]
56	Student's parents are examples of creativity	-1[b]	-1[b]

[a]significant distinguishing statement at p <0.05; [b]significant distinguishing statement at p <0.01.

B. Factor II - Teachers' Teaching Activity

Factor II had eigenvalues 7.24 which accounted for 8% of the study's variance, contains 30 respondents who had significance loading on this factor. Vietnamese teachers and students in factor II viewed a high level of agreement or disagreement with the following statements: "Teaching activity of teachers creates motivation for students creativity" (20: +5); "The teacher is ready to support the creative process of students during classes" (18: +5); "The teacher has observation, satisfaction the various needs of students in the group" (26: +4); "Style of leadership, management and organization of classes teachers" (40: +4); "The teacher is a model example of creativity" (31: +4); "The teacher and students have a positive relationship in the learning process" (29: +4); "The teacher uses fun elements in teaching" (15: +3); "In assessing learning results, the teacher highly appreciate new, unique and useful products" (11: +3); "The student can participate in many activities in the group" (23: +3); "The teacher does not use group forms of teaching" (43: -5); "The teacher does not use active methods in the learning process" (06: -4).

C. An Effective Teaching Model

Based on the results of our research, by using Q-methodology we created an effective teaching model to develop students' creative activity in the learning process with two main factors (see Fig. 3).

Figure 3 indicates factor I – teachers' teaching activity and factor II – the students themselves have a decisive role directly to the level of the development of students' creative activity. On the contrary, the development of students' creative activity re-impacts these two factors. Moreover, these factors also interact with each other. The result of students' creative activity helps students to improve their creative skills as well as helps teachers to improve their creative teaching skills. Each factor consists of many specific elements with different scores. Positive scores (+) elements are the issues that teachers and students need to focus on achieving. Elements with negative scores (-) are the issues that need to be changed and overcomed in the teaching process.

-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
25**	13*	06**	50**	15**	37**	23**	18**	14**	53**	36**
34	16	28**	03**	02**	31**	11**	22**	04**	33**	41**
	43*	05*	27**	56**	51**	19	12**	47	24**	
	07	08	52**	30**	40**	29**	45**	42	44**	
		54*	10*	55**	39**	35	17**	20**		
			46	01**	49**	48**	09**			
				21**	38	32**				
					26**					

Figure 1: An Ideal Q-Sort for Factor I. An "*" indicates a significant distinguishing statement at p <0.05; An "" – a significant distinguishing statement at p <0.01.**

-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
43*	25**	46	01**	32**	44**	36**	48**	15**	26**	20**
34	07	49**	39**	28**	04**	53**	33**	11**	40**	18**
	06**	54*	10*	09**	30**	51**	37**	47	31**	
	16	13*	55**	52**	38	14**	24**	23**	29**	
		08	21**	22**	35	19	02**	42		
			05*	56**	12**	41**	03**			
				17**	50**	45**				
					27**					

Figure 2: An Ideal Q-Sort for Factor II. An "*" indicates a significant distinguishing statement at p <0.05; An "" – a significant distinguishing statement at p <0.01.**

IV. CONCLUSION

In this research, Q methodology has been applied to build an effective teaching model for the development of students' creative activity. The data obtained were analyzed by using principal components and varimax method. There were two factors extracted which accounted for 58% of the study variance. The loading of each participant was statistically significant (above 0.34) on factor 1 or factor 2 or both at $p < 0.01$.

In Q methodology, factor interpretations are primarily based on the factor scores. The name of two factors is identified according to the names of statements with high factor scores. This model consists of two factors: the teachers' teaching activity and the students themselves. Each factor includes focal and corrective elements. Factor I had eigenvalues of 46.6, contained 64 Vietnamese teachers and students who had significance loading on this factor. Factor II had eigenvalues 7.24, contained 30 Vietnamese teachers and students who had significance loading on this factor.

Research results indicate that the goal of developing creative personalities of students will not be achieved without one of the two factors.

It can be applied in the teaching process at universities to improve creative activity for students. The study results are not only a specific orientation for teachers and students in the teaching process, but it also has implications for the educational managers and psychologists with the aim of improving the quality of education.

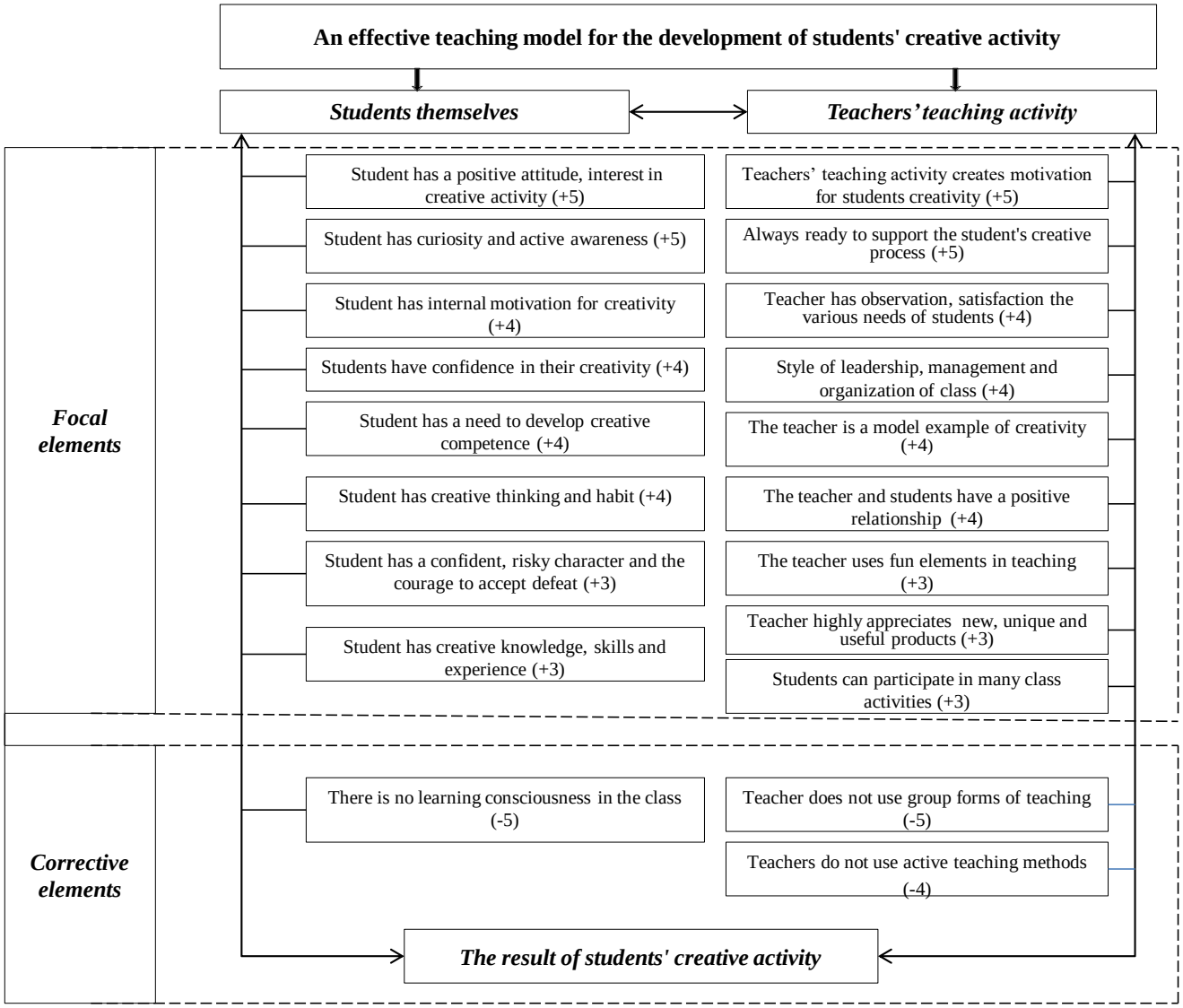

Figure 3: An Effective Teaching Model for the Development of Students' Creative Activity.

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