Investigation of Design Components of Creative Vitality in Tehran Primary Schools using R Factor Analysis*

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ABSTRACT

Vitality and creativity are among the current issues of the present century, and the effects of the spaces' environmental-physical factors, as a part of effective external factors, on the children's creative vitality are undeniable. On the other hand, the topic of creative vitality in the educational spaces of primary schools is also of great importance. Therefore, the current study aims to investigate the attitudes of school teachers and officials about the factors effective in promoting children's vitality and creativity level in primary schools and evaluate the extracted design components. It is quantitative research. After formulating the questionnaire based on a target content analysis, the sample size was calculated as 230 based on the questions in the questionnaire and using Kline approach. Therefore, the teachers and officials in Tehran's schools were chosen using cluster sampling. The collected data results were extracted in the SPSS Ver.23 based on R factor analysis. The statistical analysis of the questionnaire categorized the criteria. Its factor analysis indicates that nine significant factors as (1) familiarity and legibility of the environment on the child's adaptation to it, (2) monitorability and visibility of the environment on the child's sense of security and interactivity, (3) experienceability and imagination of the environment on multisensory and memorable games, (4) natural effects and motivational aspects of the environment on creative games and happiness child, (5) physical safety and comfort on well-being, (6) flexibility and diversity of the environment on playing and learning, (7) sociability and presence of the environment on the child's self-confidence for playing and interactions, (8) creative vitality with environmental arrays on the formation of the child's behavior, and (9) the playfulness and eventfulness of the environment on the child's creativity, along with architectural examples are practical on the creative vitality.

Keywords: Primary Schools, Creative Vitality, Design Components, Factor Analysis.

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1. INTRODUCTION

The pace of life and the emergence of phenomenal evolutions are features of this era. The generation of science and knowledge has become so fast that failure to control the constructive factors of the educational system leads to various problems. In today's advanced world, the new buildings of the schools have undergone significant changes in social as well as educational fields (Hepple et al. 2004), and any society, based on its principles and objectives, is obliged to direct and educate, and subsequently, create educational environments in accordance with these principles. On the other hand, any country's progress depends on the physical and spiritual creativity and ability as well as the mental happiness and well-being of the people of the society. The necessity of paying attention to the quality of educational spaces for the children as the founders of the country's future is felt since the children first interact with society in the educational spaces. The child's movement capacity evolves simultaneously with his physiological development and is based on how he interacts with others, giving order and direction to the child's experience (Sene and Salman 2008). There is strong evidence that the social, cognitive, and physiological characteristics the child acquires at primary school are the most essential and successful experiences. Also, it has been revealed that these characteristics organize and balance future actions in the educational system. The research indicates that the initial experience and learnings of the individual during his life positively affect his future experiences. Thus, paying attention to the growth of his skills would play a prominent role in his education (Azemati and Nowrouzian 2015, 95). Paying attention to the balanced and comprehensive growth of the child in the initial phases of his life leads to the creation of self-confidence, flourishing of creativity, growth of team spirit and social work division, and improvement of mental and spiritual states, and it is the best way to lead the society. Today, the importance and necessity of education at primary schools in different physical, mental, and emotional aspects are the main objectives of education. The process of socialization, getting ready to enter different phases of life, educational, cultural, economic, social, and political necessities, and generally, and needs of the individual, family, and society are met through the creation of optimal and suitable educational centers with appropriate and correct design (Seif 2007).

Regarding the importance of creative vitality among the users and education, which is the primary goal of schools, we will deal with the scientific investigation of influential physical factors on this subject and their influence on vitality and creative education. Therefore, the current study aims to identify and determine the design criteria of educational spaces and the interaction of the educational spaces and the child's learning process. The main research question investigates the practical factors in creative vitality using R factor analysis based on the previous round's Delphi goal-content table. The more detailed question also explores the most axial factors in achieving practical components of creative vitality. Since the experimental survey method is used in the current study, it started without a hypothesis (Delavar 2018, 21).

2. REVIEW OF RELATED LITERATURE

In this part, the most critical discussions relevant to the topic have been investigated.

2.1. Definition of Creativity-based Vitality (Creative Vitality)

In the last two decades, the concept of vitality has gotten increasingly important in psychology (Salehi 2014). Observation of normal adults, who were expected to be abnormal due to their difficult childhood, led the researchers to pay attention to the characteristics, conditions, and situations that change the adverse outcomes of growing up in an unwanted environment. In this regard, Luthar (2005) has noted the process that enables people to control life's stressful factors. He named this process 'vitality.' To put it simply, vitality is the individual's successful adaptation despite the threats and undesirable environmental conditions (Hedayat Nejad Kashi et al. 2019, 85).

On the other hand, creativity is among the critical discussions in the modern world since boosting creativity in childhood affects all phases of an individual's life. It is an influential factor in countries' development and advancement; it is considered very important (Guilford 2007). Different researchers have defined the relationship between creativity and various components and elements as separated in the following table.

Table 1. Relationship between Vitality and Creativity from the Scholars' Point of View

Reference	Definition
(Atkinson and Easthope 2008)	Vitality is one of the components of public spaces in creating a creative city.
(Pratt 2008)	Creative spaces bring vitality and happiness.
(Yuen and Ooi 2009)	Creativity makes a person satisfied with himself and, as a result, vitality.

Reference	Definition
(Jarvis, Lambie, and Berkeley 2009)	Creative spaces increase the possibility of vitality because a person feels alive when he feels that he has been creative and valuable.
(Rezvani and Khastoo 2010)	There is a mutual relationship between vitality and creativity, such that the presence of creativity in the space leads to the induction of a sense of vitality and the stimulating environment leads to the flourishing of creativity.
(Torabi 2011)	Without original and innovative thoughts, society is constantly in a state of imitation, so creativity is needed to achieve production, vitality, and independence.
(Ley and Newton 2010)	Creating conditions for the manifestation of creativity and the flourishing of talents is one of the needs of every prosperous society, and the feeling of being creative increases the vitality among the people of the society.
(Ratajczak 2011)	Creative urban spaces cause a sense of satisfaction with life and increase vitality.
(Landry 2012)	Creativity is considered one of the nine main effective criteria to identify a vital place.
(Oon and Khoo 2014)	Creativity and vitality have a direct relationship, and when a person has the opportunity to be creative, he feels alive.
(Jones and newsome 2015)	Liveliness and vitality lead to the development of creativity in a person.

With the existing definitions, it can be found that vitality and creativity highly overlap and are interdependent. Creativity is born of vitality. Therefore, no space, object, or creature that is vital but not creative can be found. Based on various definitions, creative vitality can be considered a capability of vitality with creativity, i.e., it provides the space for a variety of activities and users (with different social, cultural, and … backgrounds) and diversifies the social experiences and interactions in a way that security, equality, and comfort are provided to the user.

2.1.1. Vital and Creative Children

Psychologists in the field of research and educational specialists believe that creative abilities and divergent ways of thinking can be taught to and created in individuals, especially children, and teenagers. Stein has named characteristics such as high curiosity, unconventional, informal, modest personality, perseverance and discipline in affairs, many motivations and vast knowledge, enthusiasm and full feeling, interest in beauty and works of art, etc. Torrance (1988) believes that personality can both facilitate and restrict creativity. Personality traits such as willingness to take risks, curiosity and search, independence of thought, perseverance and stability, courage, independence of vote, self-initiation, initiative, questioning about puzzling situations, and dealing with complex matters are among the facilitating traits (Seif 2007, 599). From Bohm's point of view, man is intrinsically and naturally creative. However, internal and external factors restrict the correct activation of this capability (Bohm 2002, 36). The awareness of these internal and external barriers can help the individual boost his creativity. Numerous empirical evidence and educational theories indicate that enrichment of the growth and education environment, especially in the initial years of life, is effective in flourishing mental talents (Seif 2007, 600).

2.2. Factors Effective in the Development of Creative Vitality of Children

Some researchers believe that in addition to intelligence, the development and emergence of creative vitality depends on other factors, among which the most important are the individual's personality formation and the social and environmental state as well as the space in which the child is grown. For the realization and development of creative vitality, the mere teaching of the contents proportionate to the planning for developing creative talents is not enough. However, the individuals should be helped with detecting the points at which the motivation and skills are matched or the cross-sections of creativity. Amabile, evaluating about 7000 articles in this regard, found that only 138 of them have dealt with the interrelated background variables. He believes the environment plays a more critical role than personality factors, and changing the environmental factors is much easier than changing individual traits and talents. According to him, the main factors are motivation, creativity-related skills, and topic-related skills. These primary factors are strengthened, weakened, or annihilated under the influence of factors or barriers, among which the most important are individual and environmental factors or barriers (Amabile 1998). The factors affecting creativity can be divided into two general individuals and environmental (internal and external) categories, among which the individual factors are related to

personal traits, and environmental factors are related to the individual's stands when communicating with others (Karimi Azari 2014, 25).

2.3. Educational Spaces of the Schools and Creative Vitality

Most studies indicate that children in a monotonous environment cannot use their cognitive skills[1]. Therefore, environmental interaction is necessary to grow and flourish the child's physical, cognitive, and creative skills. The place of living in this period definitely impacts the formation of the existential structure and physical and mental growth. The quality of architectural space in educational spaces can play an educational role and function by affecting the sensual, intellectual, and perceptive cognitions (Azemati et al. 2018, 253). The investigations indicate that the education process that interacts with the open space can be very effective in the increase in learning due to gathering space, the possibility of teamwork and higher participation of the students, flexibility, and the possibility of extension of the space (Tahersima et al. 2015, 55). Some independent environmental factors are effective in the promotion of creative vitality. Natural factors of the environment and landscape creation are influential in the natural environment. Also, the works of prominent artists in space decoration and the creation of a space that allows for leaving the work (child's work) from one day to another positively affect his creativity (Shafaei and Madani 2010, 216). The development of open spaces for children's active presence and interactions can be effective in the emergence of their vitality. A child searches for a way to escape a closed, blank educational space (Akrami 2004). The open space allows for movement in and out, spatial penetration, and freedom (Lang 2010, 235). Direct contact with healthy external environments is among the critical dimensions of a child's growth. Creating a sense of belonging to the school can seriously affect the students' existence and identity. This sense is formed through creating a continuous relationship with the space and, as a result, its coordination with the individual's behavioral habits and thought patterns. Actual and potential abilities lead to a higher sense of belonging to the space, especially when the place belongs to a group (e.g., the school) (Shams Dolatabadi et al. 2019, 414).

In the new educational attitudes, education is interpreted as the act of searching and exploring. Thus, it is tried to fill the educational environment with the equipment, facilities, and motivations of curiosity, research, and exploration in a way that education is extended from the closed environment of the classrooms to the yard. Generally, the open space and the open space should fundamentally function as a classroom. Collective and dynamic games are facilitated, and the children are encouraged to participate in groups and develop social skills and abilities. These spaces activate children's intuition. Creative people usually notice the natural spaces to activate their creativity, strengthening their creative sense and power. The skills acquired from interaction with the local social environment, such as physical, verbal, and social skills acquired by playing team and environmental games, undoubtedly facilitate the children's creativity (Mozaffar et al. 2007, 66). Therefore, the school plays a vital role in forming students' personalities through developing opportunities for various activities, especially in the initial phases of forming their social skills.

The obtained criteria have noted the mental-psychological, social, functional, perceptual-experimental, and physical-environmental dimensions in the design of schools' educational spaces for the creative vitality of children. The components relevant to each of these dimensions are presented in Table (2).
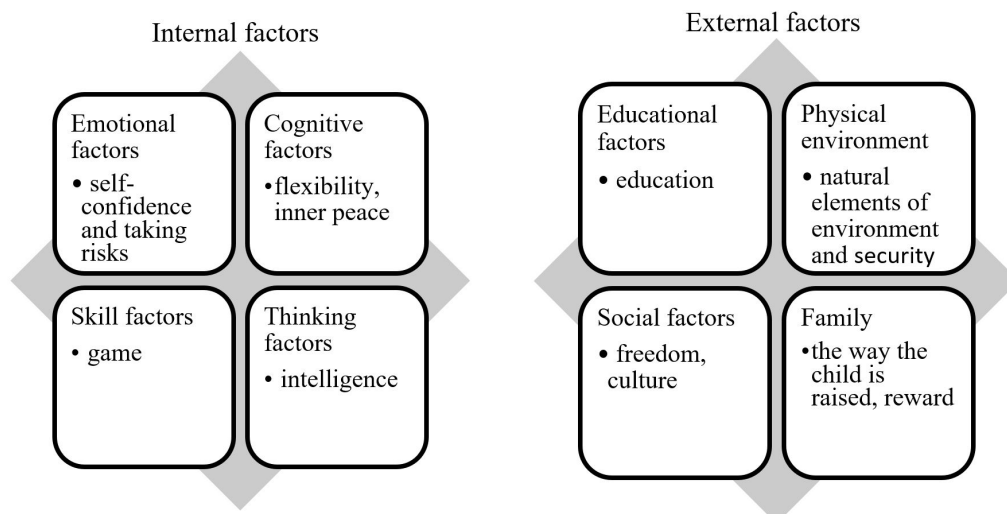

Fig. 1. Effective Internal and External Factors
(Karimi Azari et al. 2016, 21)

Table 2. Most Critical Criteria for the Promotion of Primary Schools Students' Creative Vitality from a Specialist's Perspective

Concepts	Components Relevant to the Concepts					
	Physical-Environmental Security and Safety	The Imagination of the Environment	Environmental Welfare	The Flexibility of Spatial Structure	Interactive Environment	Environment's Playfulness
Mental-Psychological	Legibility	The Ability to Visualization and Memorability	Mental Peace	-	Environment's Attractiveness	Innovation, Freedom of Choice, and Curiosity
Social	-	Eventfullness	Attendancy	The Possibility of Intervention in the Environment and the Ability to Choose	Attendancy, the Possibility of Active and Passive Recreation, Freedom of Choice, and Eventfulness	Attendancy and Lack of Barriers
Functional	Visual Transparency	The Ability to Explore the Environment	Environmental Comfort, Facilities, and Cleanliness	Changeability, Functional Variety, and Diversity of Activities	-	Versatility and Spatial Diversity
Physical-Environmental	-	Dimensions and Proportions, and Layout of the Environment	Visual Coordination and Order	Color and Texture of Materials, Presence of Water, Dynamic Green Space, and Visual Variety	-	The Dynamics of the Environment and Light and Shadow
Perceptual-Experimental	Experience of Environment	Visual Relations, Experience, Environmental Sensory Stimuli, and Familiarity	Connection with Nature and Proper Vision	-	Inviting Environment	Connection with the Nature

The present study examines the effects of the spatial characteristics of the primary schools' educational environments on creative vitality and improving the quality of students' learning from the perspective of school teachers and officials. Considering the importance of the research literature in the field of the subject under discussion, the creative vitality and its dimensions were discussed at first. Then the factors affecting the variables were examined, and the most important criteria for promoting the creative vitality of primary school students were expressed from the experts' perspective. In the following, considering the influence of the environment on creative vitality, the influential factors have been investigated from the point of view of school teachers and officials.

3. METHODOLOGY

A cross-sectional survey[2] design has been used in the present study to explore the school teachers' and officials' population. A questionnaire has been developed based on the creative vitality principles as the instrument to measure the students' opinions. Therefore, content analysis and Delphi methods have been used to obtain this questionnaire as the research instrument for the survey. The question collection and extraction method is as follows: In the first stage, the qualitative research method has been used. In this stage, through the review of up-to-date sources, the data was first collected, and then, using logical reasoning, the formation was selected and used. The Delphi method was used qualitatively and quantitatively in the second stage, which aims to explore the unique information from the specialists' population who review the ideas and attitudes of scholars in a specific field (Sarmad 2016, 38). The Delphi technique was used since, in the document mining method, the current scientific information was not evaluated as adequate for the present study. It is used in several stages.

In the first stage, the concepts extracted from the literature were provided to the specialists, who were primarily architects, other urban planners, and psychologists, all of whom were members of faculties

in high-rated Iranian universities and experts in the field of research in the form of in-depth interview through an open-ended questionnaire. This part of the Delphi method is qualitative, aiming to select the data collected from document mining and exploring newer information than existing information in the scientific arena (Bastani Mahmoudi 2018, 7). After extracting and collecting the data by document mining and Delphi's first round, the information is formulated as open coding and bipolar continuums for exploration and sense-making of the concepts. Axial coding is obtained from the two-by-two combination of continuums. Axial coding was formed from the vertical-horizontal combination of two continuums and their labeling. It resulted in a goal-content table in which the contents are categories extracted from the correspondence of the continuums, and the goals are the same as extracted concepts. In Delphi's second round, after the open and axial coding and creation of the goal-content table, the questions are extracted for the second questionnaire to measure the experts' attitudes in the cognitive, practical, and behavioral levels in the answer-stop form.

In this stage, to measure the validity of the instrument, five experts were asked to evaluate the information to apply modifications if needed. Then, a 92-question questionnaire with a 10-choice scale was developed. In Delphi's third round, the test was administered among the experts. The results obtained from this stage are in the form of concept extraction through factor analysis. In the next stage, to measure the reliability of the questionnaires and assess answer repeatability, a new questionnaire was developed with the omission of some questions and re-administered among the same experts, and factor analysis was done for it. The goal-content table in the present study is formed in a way that the content consists of the concepts extracted from Delphi's third round. It should be noted that the content analysis assessed the validity of the researcher-made instrument, and its reliability was assessed by re-test.

3.1. Statistical Population

The present study's statistical population includes school teachers and officials, and the random cluster sampling method has been used to choose the samples. Since the complete list of the population is not available, this method will be suitable (Naderifar, Goli, and Ghaljayi 2017, 178). The sample size is 230 persons, including the school teachers and officials, mainly from Municipal Districts No. Four, eight, and fourteen as the representatives of the social and economic community of Tehran because Kline considers the sample size to be 21-41 persons per each variable, or 2.5-5 persons per each question (Kline 2010, 31). Thus, using this method, and regarding the number of questions which is 58 203 persons as the sample size, would be sufficient. However, 230 persons were selected as the sample to ensure the

reliability of the results.

3.2. Research Instrument

In the present research, an answer-stop questionnaire has been used as the research instrument[3]. As was previously mentioned, the questionnaire was developed after two rounds of factor analysis of experts' opinions and extraction of their concepts. It is formulated, extracted, and designed after several Delphi rounds through semi-structured interviews and two answer-stop questionnaires. The questions are formulated in the form of a 4-option multiple choice question on the Likert scale with four choices of "totally disagree," "disagree," "agree," and "totally agree" (Sharagard Monfared 2015, 67). In the present study, the goal-content table and questionnaire were used for the school teachers and officials, extracted by the R-type factor analysis and the software. The questionnaire was developed by the goal-content table and factor analysis, as well as the content and construct validity, and Cronbach's alpha was used to assess its reliability.

3.3. Validity and Reliability of the Questionnaire

Cronbach's alpha is among the reliability measurement methods. It is suitable for cases in which the scores are multi-valued, like the scores obtained from the attitude measurement, where the respondent answers each question in a range from totally agree to disagree. None of the options are considered right or wrong (Seif 2004, 456). The Cronbach's alpha value should be above 0.7, which means the homogeneity of the data. In the present study, Cronbach's alpha was used, and the finalized questionnaire reached an alpha value of 0.964 after the looping and necessary modifications (Table 3).

Table 3. Total Reliability of Questions

Number of Questions	Cronbach's Alpha
58	0.964

In the present study, 30 school teachers and officials were primarily asked in the form of a pilot. The results were inputted into the SPSS Ver.23, and the questions were analyzed in this stage. The discriminant coefficient is another method to analyze the questions of the questionnaire. In the present study, the table related to the discriminant coefficient extracted from the SPSS can help to ensure the validity of each item. After these stages, the researcher-made questionnaires are filled out and validated.

A test is valid if it is sufficient and suitable for what is intended (Seif 2004, 418). The present study uses various types of content, face, and construct (factor analysis) validity. The goal-content table has been used to measure content validity. It is necessary to measure it since the measured variable itself consists

of other variables. Face validity has been used in the present research to validate the research instrument. To check if the listed items are suitable for measuring the desired objectives, the experts approved them. Also, to ensure face validity, the questionnaire was handed out to 10 officials to determine their interpretation of questions by only reading them so that the researcher could ensure the correct and easy understanding of the question. These people, without answering the questions, have only expressed the meaning of the questions and provided suggestions for easier understanding of the questionnaires, if any.

Construct validity is achieved through factor analysis. First, the Measure of Sampling Adequacy test should be administered to implement factor analysis. After data rotation, the Sampling Adequacy was measured by the KMO and Bartlett's Test. The KMO test's result should be above 0.6, which was 0.920 in the present research. As a result, the sample size is adequate. In Bartlett's Test, the factor analysis is suitable if the sig (significance level) is lower than 0.05. In the present research, Bartlett's test sig is close to zero (Sahragard Monfared 2015, 37) (Table 4).

Table 4. KMO and Bartlett's test for Factor Analysis

Sampling Adequacy	0.920
Bartlett's Test of Sphericity (chi-square) Estimate	7026.497
Degree of Freedom	1485
Significance Level	0.000

4. FINDINGS

Post-rotation data analysis indicates that from the collection of respondents (school teachers and officials), 11 factors were identified, which are presented in the following table. The total collective percentage of these 11 factors is 63.024% indicating

that 63% of the respondents thought alike, and 37% thought personally, which may be derived from personal information, tendencies, or inclinations. Therefore, it means that there was an external reality that could direct 63% of the respondents' thoughts to themselves and thus formed their common ideas (Table 5).

Table 5. Data Variance after Factor Analysis Rotation

Component	Pre-rotation			Post-rotation		
	The Cumulative Percentage	Variance Percentage	Total	The Cumulative Percentage	Variance Percentage	Total
1	37.642	37.642	20.703	7.936	7.936	4.365
2	41.434	3.792	2.086	15.831	7.895	4.342
3	44.595	3.161	1.739	23.248	7.417	4.080
4	47.419	2.824	1.553	30.212	6.964	3.830
5	50.047	2.628	1.445	36.503	6.290	3.460
6	52.629	2.582	1.420	42.511	6.008	3.304
7	54.901	2.272	1.249	47.913	5.403	2.971
8	57.039	2.139	1.176	52.618	4.705	2.588
9	59.121	2.082	1.145	57.247	4.629	2.546
10	61.137	2.016	1.109	60.271	3.024	1.663
11	63.024	1.887	1.038	63.024	2.753	1.514

Items with a factor loading above ±0.3 are considered significant and categorized under that factor. Here,

the sort option is used for factor analysis since the constituent items of each factor should be shown

in order of importance. Interpreting the rotated data matrix table determines how many factors are definable and meanable, and each factor has included which items (Table 6). Interpretation of the rotated data matrix indicates nine definable factors.

Table 6. Rotated data Matrix and Factor Loading of each

	Components										
	1	2	3	4	5	6	7	8	9	10	11
q58	0.652	0.209	0.054	0.263	0.242	0.096	0.133	0.144	0.139	0.007	0.023
q44	0.556	0.214	0.405	0.208	0.112	0.148	-0.074	0.093	-0.023	0.067	0.082
q2	0.518	0.126	0.033	0.145	0.048	0.257	0.307	0.227	-0.037	0.116	-0.039
q30	0.488	0.106	0.247	0.073	0.384	-0.003	0.145	0.111	0.278	0.067	0.188
q31	0.453	0.177	0.387	0.106	0.121	0.070	0.255	0.088	0.060	0.180	0.053
q28	0.446	0.216	0.284	0.049	0.260	0.087	0.138	0.133	0.316	0.108	0.162
q57	0.424	0.355	0.163	0.221	0.301	0.071	0.084	0.137	0.158	0.141	-0.140
q18	0.386	0.190	0.136	0.067	0.369	0.261	0.125	0.131	0.103	0.228	0.156
q26	0.382	0.149	0.341	0.124	-0.072	0.153	0.340	-0.049	0.209	0.100	0.318
q29	0.350	0.670	0.229	0.116	0.155	-0.039	0.193	0.055	0.003	-0.039	0.170
q42	0.099	0.580	-0.006	0.142	0.352	0.147	0.169	0.318	0.119	-0.097	-0.047
q5	0.099	0.533	0.182	0.137	0.083	0.318	-0.081	0.117	0.012	0.431	-0.026
q15	0.181	0.523	0.193	0.234	0.127	0.386	0.145	0.158	0.124	0.024	-0.114
q35	0.281	0.494	0.210	0.244	0.095	0.089	0.054	-0.101	0.374	0.120	0.124
q34	0.053	0.492	0.206	0.052	0.146	0.171	0.366	0.034	0.174	0.136	0.255
q23	0.136	0.477	0.112	0.128	0.382	0.089	-0.069	0.228	0.113	0.171	0.269
q25	0.370	0.452	0.297	-0.080	0.120	0.302	0.221	-0.035	0.181	-0.015	0.090
q49	0.114	0.425	0.330	0.348	0.134	0.177	0.206	0.227	0.225	-0.028	0.006
q27	0.273	0.425	0.271	-0.052	0.160	0.202	0.170	0.156	0.100	0.320	0.159
q53	0.155	0.187	0.629	0.071	0.031	0.280	0.180	0.270	0.151	0.009	0.054
q45	0.090	0.181	0.609	0.218	0.194	0.105	0.114	0.098	0.085	0.118	0.252
q51	0.299	0.156	0.603	0.175	0.302	0.151	0.139	0.063	0.180	0.026	-0.140
q43	0.366	0.252	0.477	0.275	0.239	0.251	0.008	0.059	0.066	-0.074	0.041
q39	0.028	0.350	0.475	0.174	0.393	-0.022	0.207	-0.051	0.035	0.106	0.026
q54	0.313	0.123	0.468	0.377	-0.036	0.178	0.185	0.122	0.058	0.170	0.014
q37	-0.049	0.007	0.418	0.330	-0.073	0.068	0.139	0.235	0.331	0.355	0.186
q56	0.138	0.246	0.081	0.635	0.015	0.114	0.065	0.172	0.147	-0.068	0.301
q55	0.041	0.290	0.111	0.631	0.043	0.146	0.127	0.214	0.196	0.003	0.049
q41	0.162	-0.117	0.293	0.617	0.253	0.083	0.133	0.273	0.079	0.160	0.027
q40	0.212	0.059	0.215	0.588	0.096	0.239	0.071	0.092	0.121	0.169	0.030
q47	0.250	0.217	0.282	0.463	0.240	0.117	0.277	-0.076	0.197	0.105	-0.245
q48	0.303	0.092	0.107	0.460	0.404	0.038	0.289	0.227	-0.007	0.024	0.156
q22	0.267	0.251	0.259	0.056	0.624	0.123	0.040	0.238	0.157	-0.001	0.067
q10	0.182	0.112	0.033	0.060	0.607	0.241	0.178	0.039	0.077	0.113	0.106
q21	0.185	0.238	0.224	0.229	0.496	0.365	0.127	0.107	0.114	0.110	0.149
q50	0.089	0.247	0.377	0.248	0.461	0.220	0.328	0.145	0.183	-0.144	-0.162

| | Components |
	1	2	3	4	5	6	7	8	9	10	11
q7	0.044	0.144	0.199	0.138	0.184	0.632	0.118	0.147	0.017	-0.058	0.080
q11	0.225	0.418	0.138	0.158	-0.015	0.536	0.097	-0.006	0.146	0.085	0.288
q16	0.432	0.099	-0.003	0.283	0.243	0.516	0.203	-0.115	0.082	0.203	-0.054
q8	-0.021	0.211	0.165	0.102	0.338	0.498	0.080	0.330	0.110	0.294	-0.032
q9	0.213	-0.009	0.159	0.173	0.229	0.456	0.034	0.174	0.090	0.351	0.104
q14	0.301	0.233	0.051	0.303	0.174	0.433	0.209	0.039	0.013	0.154	0.344
q33	0.107	0.088	0.155	0.161	0.162	0.089	0.787	0.056	0.058	0.041	0.094
q32	0.184	0.112	0.148	0.078	0.131	0.167	0.746	0.190	0.131	0.013	-0.009
q46	0.186	0.239	0.141	0.241	0.055	0.021	0.482	0.100	0.373	0.149	0.064
q4	0.034	0.119	0.177	0.227	0.110	0.141	0.093	0.641	0.183	0.000	0.041
q1	0.201	0.244	0.058	0.176	0.157	0.065	0.169	0.638	-0.153	0.167	0.052
q6	0.189	-0.018	0.091	0.349	0.120	0.053	0.025	0.505	0.253	0.228	0.059
q12	0.338	-0.033	0.138	0.043	-0.007	0.389	0.120	0.410	0.405	0.047	0.033
q52	0.330	0.104	0.270	0.075	0.168	0.327	0.107	0.336	0.308	-0.281	0.047
q38	0.011	0.167	0.082	0.271	0.156	0.114	0.281	0.064	0.637	0.114	0.092
q24	0.342	0.276	0.095	0.200	0.298	0.205	-0.028	0.101	0.538	-0.081	-0.135
q36	0.108	0.122	0.357	0.181	0.158	-0.047	0.132	0.206	0.497	0.160	0.256
q17	0.329	0.142	0.096	0.159	0.155	0.122	0.197	0.180	0.176	0.568	-0.114
q20	0.053	0.179	0.139	0.218	0.285	0.215	0.100	0.097	0.141	-0.101	0.589

Interpretation of the rotated data matrix indicates 9 definable factors since two or fewer items are included from the ninth factor onward. The first factor is the largest and most reliable factor, with its items having factor loadings as 58, 44, 2, 30, 31, 28, 57, 18, and 26, respectively. The loading factors of the second factor's items are 29, 42, 5, 15, 35, 34, 23, 25, 49, and 27, respectively. The loading factor of the third factor's items is 53, 45, 51, 43, 39, 45, and 37, respectively. The fourth factor includes items Nos. 56, 55, 41, 40, 47, and 48, respectively. The fifth factor includes items Nos. 22, 10, 21, and 50, respectively. The sixth factor includes items Nos. 7, 11, 16, 8, 9, and 14, respectively. The seventh factor includes items Nos. 33, 32, and 46, respectively. The eights factor includes items Nos. 4, 1, 6, 12, and 52, respectively. Furthermore, finally, the ninth factor includes items Nos. 38, 24, and 36.

4.1. Defining and Naming the Extracted Factors from Factor Analysis

In this stage, the researcher tried to name each factor based on its constituent items and shared content. It should be noted that more significant factor loading indicates a higher item value. Therefore, items with higher factor loading are more focused. After identifying significant factors and their constituent items, each factor was defined and named. However, the interpretation of factors is based on the common content of the items relevant to each factor, and semantic correspondence of each factor is done based on the architectural variables and goal-content table as well as the field observations by the researcher.

4.1.1. First Factor: Effects of Environment's Familiarity and Legibility on Child's Adaptation to it

The content of the items of the first factor is the inviting environment (with qualities such as integration, spatial differentiation, and creating a landscape), a clear image of the environment (with qualities such as the simplicity of the place, spatial organization, and prominence of the sign), link paths between spaces, adaptation to the environment, the possibility of active and passive recreation, the combination and interference of open and closed spaces and walls, creating familiar images of the environment with its easy understanding, the use of colors and materials of natural and building materials, the use of indicator elements (such as elements, signs, and sculptures) in sociable spaces.

4.1.2. Second Factor: Effects of Environment's Monitoring and Visibility on the Child's Sense of Security and Interactivity

The second factor's items include the use of forms with natural shapes and free lines in spaces and walls, the visibility of private spaces and the lack of apparent

separation of spaces from each other, the visibility of flexible spaces, paying attention to dimensions and proportions in closed spaces, creating a clear image from the environment with the optionality in it, the possibility of children's participation and intervention in making furniture and organizing spaces, using natural elements such as light and shadow and creating it in the school at different times of the day, creating appearance diversity (with potentials such as proportion, difference, harmony, and positive contrast) in the floor, body, furniture, and other formal elements, creating diverse links between spaces, multi-functional spaces with the ability to accept the children's attendance.

4.1.3. Third Factor: Effects of Environment's Experienceability and Imagination on the Multi-sensory Games and Memorability

The third factor's items include stimuli to use all kinds of children's senses, forms, colors, and memorable spaces, a comprehensible environment, spaces with the ability to focus attention to create or recreate an experience in mind to stimulate the imagination, and ability simply to look at the pictures and get a good understanding of the information, stimulating environments in the school to use the senses, and spaces to encourage students to participate in all kinds of collaborative and group interactions.

4.1.4. Fourth Factor: Effects of Environment's Natural Manifestations and Motivational Aspects on Child's Creative Games and Happiness

The fourth factor includes green spaces and natural light in indoor environments and monitoring the growth of plants by children, setting spaces in the school in a natural green environment, the possibility of developing innovative activities for creative games, the ability to motivate children, attractive spaces to increase children's interactions, and creating mental peace in children.

4.1.5. Fifth Factor: Effects of Physical Safety and Comfort on Welfare

The fifth factor includes apparent coordination and order, welfare and educational facilities and services, arrangement and decorating of the environment and flexible furniture, and landscapes with a suitable view.

4.1.6. Sixth Factor: Effects of Environment's Flexibility-Diversity on Playing and Learning

The sixth factor's items include changeable spaces in the school (such as furniture or changeable walls), flexible and diverse spaces (with the ability to expand and be limited by furniture), dynamic spaces, appropriate scale for children in spaces and furniture, flexible spaces with the ability of various functions for

learning and playing, the combination and interaction of evident and hidden spaces and various connections between them.

4.1.7. Seventh Factor: Effects of Environment's Sociability and Attendancy on Child's Self-confidence for Playing and Interaction

The seventh factor's items include children's freedom of choice in the environment, spaces with freedom of choice, and children's freedom of choice.

4.1.8. Eighth Factor: Effects of Environment's Playfulness and Eventfulness on Child's Creativity

The eighth-factor items include diversity in spaces and colors for various activities, compatibility of the environment with the child's needs, diverse spaces with the ability to explore them, a clear image of the environment, and the ability to understand its experiences quickly.

4.1.9. Ninth Factor: Effects of Creative Vitality alongside the Environmental Arrays on Child's Behavior Formation

The ninth factor includes children's participation and not restricting them in using the environment and its capabilities, diverse and pleasant form and geometry in the school environment (for spaces, walls, and furniture), creating multi-functional spaces in the yard and indoor space for holding child shows and theater.

5. CONCLUSION

The present study aimed to extract design components of schools' educational spaces with a creative vitality approach. The results indicated that educational spaces of primary schools could be an influential setting for learning and environmental experience of different social, functional, physical, psychological, and perceptual aspects. These experiences and learnings in different aspects include various aspects of the child's vitality and creativity and lead to his creative vitality. The spaces previously meaningless to the child become understandable meaningful places to him over time through acquiring the environment experience and playing and other activities. Accordingly, some opportunities are created for individual and team learning. Therefore, if some conditions are created in which the child can freely act, play, and interact with a sense of mental peace, it will encourage him to participate in the space, and creative activities accompanied with vitality in the educational spaces will be more likely. As a result, in terms of the spatial structure, the educational spaces are meant as a suitable platform for developing and promoting a child's creativity and creative vitality. Regarding the conducted study on the extracted

design components in the schools' educational spaces, the degree to which the creative vitality influences it was expressed considering the examples. Nine significant factors as (1) familiarity and legibility of the environment on the child's adaptation to it, (2) monitorability and visibility of the environment on the child's sense of security and interactivity, (3) experienceability and imagination of the environment on multisensory and memorable games, (4) natural effects and motivational aspects of the environment on creative games and happiness child, (5) physical safety and comfort on well-being, (6) flexibility and diversity of the environment on playing and learning, (7) sociability and presence of the environment on the child's self-confidence for playing and interactions, (8) creative vitality with environmental arrays on the formation of the child's behavior, and (9) the playfulness and eventfulness of the environment on the child's creativity were defined along with its examples.

ENDNOTE

1. Studying in school applies abilities to use emotions in different aspects. For example, using these skills facilitates students' thinking and concentration. It also helps students turn negative emotions into positive ones (Costa and Faria, 2015).
2. Survey questionnaires are often consistent with research on mutual sociocultural relations or perceptual concepts of environment and architecture (Mir Moqtadaei et al. 2018, 3).
3. Answer-stop questionnaire was developed with a four-point Likert scale, in which the five concepts obtained from the previous stage were asked by school teachers and officials to measure their views. The content of the developed questionnaire is generally similar to the experts' questionnaire, which has been revised to make it easier for school teachers and officials to understand.

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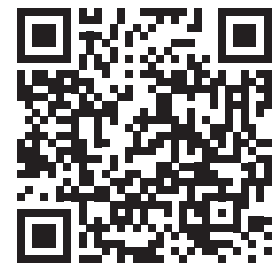*Human Geography* 90(2): 107-117. http://eprints.lse.ac.uk/207041//Creative_cities_(LSERO_pre-print).pdf.

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