

# THE DEVELOPMENT OF CREATIVITY SCALE FOR PROSPECTIVE TEACHERS

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## Abstract

The purpose of this study is to develop a self-report creativity scale by conducting survey method of prospective teachers. Participants were 726 prospective teachers from twenty educational degree colleges in this study. Based on many empirical studies, creativity measures indicated many problems and limitations. The creativity measure is based on the Khatena Torrance Creative Perception Inventory (KTCPI) and other creativity self-report instruments. After exploratory factor analysis and confirmatory factor analysis, four factors appear (1) Sensation of Environmental conditions (2) Self-belief (3) Imagination (4) Willingness and curiosity. Insights gained from this study enables adult educators to improve existing learning situations as well as develop new, more effective programs for student teachers.

**Keywords:** Creativity, Prospective Teachers, Imagination

## Introduction

In today knowledge-based economy, creativity plays an important role in obtaining global competitive advantage because it is the manifestation of wisdom and knowledge of the human brain, which can transform creativity into economic value and offer people and organizations a sustained competitive advantage. Thus, creativity is also deemed an invaluable asset of the human brain, a necessary human resource in the 21st century, and a powerful means to improve the quality of life (Williamson, 2001). Teachers have always played a crucial role in preparing communities and societies and exploring development. They are the prime agents of change. The Government and the community should endeavor to create conditions which will motivate and inspire teachers on creativity. The greatest joy and the greatest hope for better world lie in the cultivation of creative power of the teacher. Primary education occupies the most important place in the ladder of education. Education Degree College of primary level which are called as Diploma of Teacher Educator (DTEd) play an important role in producing quality teachers for primary schools.

Education Degree Colleges have a policy about the quality of its graduates. Its vision is to be a leader in education, proficient teachers and education personnel, and promote research into local development. Thus, the aim is to enhance the quality of student teachers and society so that they have the potential to compete both nationally and internationally. Its mission is to produce teacher educators with knowledge and of sound morality. The creativity of student teacher is an important feature that will strengthen the community in its work and benefit local development.

## Purpose of the Study

The main purpose of this study is to develop the creativity scale of measuring prospective teachers.

## Definition of Key Terms

**Creativity:** Guilford defined creativity in terms of two criteria: originality (or novelty) and appropriateness, i.e., relevance to the task at hand, and this two-criterion definition become standard (e.g., Amabile, 1996; Feldman, Csikszentnuhalyi & Gardner, 1994; Runco, 2014; Sternberg, 1985).

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**Prospective Teacher:** Student teacher candidates with the knowledge, attitudes, behaviors and skills they require to perform their tasks effectively in the classroom, school, and wider community. (Operational definition)

**Imagination:** Imagination generally refers to the ability to mentally represent that is not physical presented. (Operational definition)

### Review of Related Literature

Creativity is a highly complex and diffused construct (Sternberg, 1985) and hence, there is a lack of general consensus in defining creative behavior. A conceptual definition of creativity is presented by Guilford (1967). He proposed divergent thinking perspective to comprise of four dimensions: (a) fluency reflecting individual ability to generate numerous ideas, (b) flexibility reflecting the ability to generate ideas with a much broader range, (c) originality reflecting the ability to generate novel idea(s), and, (d) elaboration reflecting the ability to develop ideas further giving more meaning, depth, and strength (Mathew, 2001).

Creativity and creative behavior are not a homogeneous psychological attribute. Creativity and creative behavior are the result of complex interaction between varying characteristics and attributes of the individual and the environment (Mumford & Gustafson, 1988). According to these authors, creativity comprises of the following elements: (a) the underlying phenomena and inherent ability of the individual to generate new ideas, (b) the characteristics of the individual to help facilitate the process operation, (c) the qualities and abilities of the individual to transform ideas into implementation, (d) motivational factors encouraging the individual to be creative, and (e) the attributes of the work environment by providing feedback for individual effort. Creativity was defined by Amabile (1983, 1996) as comprising of essential elements of novelty, appropriateness, and usefulness. Creativity is often assessed against the immediate context or work situation. Creativity is defined as the generation of new ideas, and innovation as the translation of these ideas into action (Mumford & Gustafson, 1988). These situations demand ideas or responses or solutions much more than routine or mundane standard actions typically deemed appropriate given their powerful influence on organizational performance (Arad, Hanson & Schneider, 1997). Amabile (1996) also posited that the context or task needed to possess a heuristic rather than algorithmic dimension. Given the nature of the context, creative activities entail identifying the problem in heuristic contexts. Historically within the work context, creativity has been viewed as an individual phenomenon that interacts with barriers of cognitive abilities, attribution biases, social and contextual factors (Mathew, 2001).

Researchers and educators have used tests of the thinking. In this category, the Torrance Tests of Creative Thinking (TTCT) attempt to evaluate cognitive abilities of creative by measuring divergency (Davis, 1989). The TTCT has been extensively evaluated. Torrance (1975) analyzed TTCT research and concluded that there was evidence of a linkage between performance on the test and real-life achievement. A second category of tests is the personality/biographical inventory, such as the Khetena Torrance Creative Perception Inventory (KTCPI), which examines attitudes, motivations, interests, and histories of creative activity. The KTCPI has also been used widely to identify creative individuals in school and college settings. According to Khetena and Torrance (1998), it may be used as a diagnostic tool to encourage creative thinking and creative behavior. The KTCPI will be used in this research because it has been used extensively in previous research and was specifically designed to measure creative self-perception. There is considerable support for using the KTCPI in measuring creativity, particularly among college-age individuals. There is widespread agreement that psychologists can get a reasonable estimate of creative potential through creativity testing (Gardner & Wolf, 1994). There are some limitations to using the KTCPI in research. As these critiques of the

KTCPI remind researchers, many mental operations such as cognition, memory, convergent thinking, evaluation, and problem solving play a role in creative thinking.

Torrance himself contends that the weakest link in shaping education toward creative growth and accomplishment is the lack of appropriate instruments for assessment. A review of creativity measures indicate problems and limitations concerning creative process assessments. Based on the results of past research, the purpose of the current study was centered on creating a self-report scale to assess the use of various cognitive processes associated with creativity. The scale was constructed in such a way as to address creative processes in more general “real world” situations, rather than the more specific and arbitrary tasks contained in many divergent thinking measures. This study will help to measure the psychometrics tradition of creativity as a step toward improving the creativity scale development.

### **Method**

This study is cross-sectional in nature and descriptive survey method.

#### **Participants of the Study**

Participants of this study were first year students from Education Degree College in the academic year of 2019-2020. Female were 62.19% and the rest are the males. There are fourteen Regions and States in Myanmar. In this study, 212 participants were from Mandalay Region, 39 from Yangon, 25 were from Bago, 30 were from Magway, 132 were Sagaing, and 76 were from Ayeyarwady Region. According to the State, 141 participants were from Shan State, 20 from Kayar State, 4 from Mon State, 11 from Chin State, 13 from Kayin State, 23 from Rakhine State.

#### **Data Collection Procedures**

The random sampling method was used in this study. Data for this study was collected entirely online using Google forms. Participants in this study were given access to the web address, and after giving informed consent completed the battery of measures in one testing session. Once response has been submitted, participants were linked to a page with debriefing information. This survey was conducted over a period of one month in October, 2020.

#### **Instruments**

According to Garfield, Taylor, Dennis and Satzinger (2001 as cited in Naude, 2005), it is now the time to adjust our research paradigms, and to start from scratch in understanding and investigating the role of individual differences in the design, enhancement and use of information systems. By realizing the role of individual traits in the creative process, systems can be put in place for the broad incorporation of tools for the enhancement of individual characteristics (Naude, 2005). The three instruments used for this study were either adopted, adapted or designed by the researcher. The descriptions of these instruments are as follows.

#### **The Khetena- Torrance Creative Perception Inventory (KTCPI)**

In this study, the first instrument used was the Khetena-Torrance Creative Perception (KTCPI). This is an autobiographical measure/ test entitled “Something About Myself” (SAM). This measure is based on the rationale that the personality characteristics of an individual, the thinking strategies he employs, and the products that emerge as a result of creative striving will reflect creativity (Khetena, 1977).

SAM is made up of 50 items, which can be easily administered and interpreted. It presents statements to which participants are required to respond with the expectation that the responses will reflect the extent to which they tend to function in creative ways. SAM yields 6 factors or creative orientations (Khatena, 1973). These orientations are Environmental

Sensitivity, Initiative, Self-Strength, Intellectuality, Individuality, and Artistry. The KTCPI can be used with adolescents or adult participants. The KTCPI questionnaires used a 5-point Likert scales ranging from strongly disagree= 1, to strongly agree= 5.

### **Cognitive Processes Associated with Creativity (CPAC)**

As mentioned above, creativity was influenced by cognitive processes, external factors and personality. Cognitive Processes Associated with Creativity (CPAC) was used for this study. CPAC is developed by Miller, 2005. It includes 47 items. It is divided into six components: Incubation, Perspective-taking, Metaphorical and Analogical Thinking, Brainstorming, Imagery, and Flow. This instrument is used for undergraduate students. It is a 5 point Likert Scales ranging from strongly disagree=1 to strongly agree= 5.

### **Creativity Questionnaire (Fields and Bisschoff, 2014)**

Torrance Test of Creative Thinking (TTCT) is the most popular test in educational setting. It is the most recommended test in educational field and can be administered as an individual or group test from kindergarten level to graduate level and beyond. It is also the most referenced of all creativity tests (Kim, 2006). Torrance (1990 as cited in Kim, 2006) identified creative strengths in his TTCT assessments, “emotional expressiveness, storytelling articulateness, movement or action, expressiveness of titles of lines or circles, unusual visualization, internal visualization, extending or breaking boundaries, humour, richness of imagery, colourfulness of imagery and fantasy”. The main focus of TTCT was to understand and nurture qualities that help people express their creativity (Kim, 2006).

Kleiman (2008 as cited in Fields and Bisschoff, 2014) developed a conceptual map of creativity in teaching and learning which was created from Phenomenography. Phenomenography focuses on the different number of ways in which individuals “experience, perceive, apprehend, understand and conceptualizes various phenomena (Tan and Prosser, 2004 as cited in Fields and Bisschoff, 2014). The research is still emergent and requires further analysis, but it offers helpful clues regarding creativity in the context of learning and teaching.

The Educational Model for Creative development (PECE) was developed by the institute of Creativity and Educational Innovations (INCEI) at the University of Valencia. The model adopts the approach that creativity can be taught and is an acquired skill. The model is related to the individual (development of creative and entrepreneurship spirit), to the process (of innovation), to the product, and to the context. The model assumes that creativity involves a set of attributes (like self-confidence, desire for achievement, sensitivity) and thinking skills (like fluency, mental flexibility, imagination). The model can be used to teach creativity and measure the educational quality of creativity. As this model, there is a lack of one specific valid and reliable test that can be used to measure creativity at undergraduate educational level, Fields and Bisschoff developed the Creativity Questionnaire in 2014. It includes 34 items and its factors are challenging the Status quo, detachment, Synthesis, cognition, associate and communicate, awareness, similarity, external motivation, sensitivity, experiment and combine, dimensional thinking and problem-solving. This instrument is used for undergraduate students. It is a 5 point Likert Scale ranging from strongly disagree to strongly agree.

### **Findings**

Exploratory factor analysis (EFA) is a classical formal measurement model that is used when both observed and latent variables are assumed to be measured at the interval level (Fontaine, 2005). EFA was used to uncover the underlying structure of a relatively large set of creativity measures.

Principal axis factor analysis with varimax rotation was conducted to assess the underlying structure for the ninety eight items of the creativity questionnaires was examined in Table 1.

**Table 1** KMO and Barlett’s Test

Kaiser_Meyer_Olkin Measure of Sampling Adequacy		.927
Approx. Chi –Square		14442.57
Barlett’s Test of Sphericity	<i>df</i>	4753
	<i>Sig</i>	.000

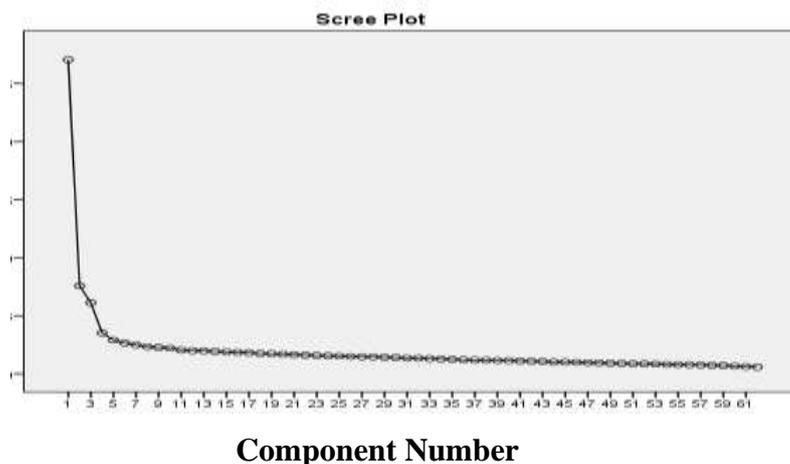
The Kaiser\_Meyer\_Olkin (KMO) measure are greater than 0.70 and is inadequate if less than 0.50. The KMO test tells one whether or not enough items are predicted by each factor. The Barlett test is significant ( $p<0.5$ ); this means that the variables are correlated highly enough to provide a reasonable basis for factor analysis of creativity.

Principal axis factor analysis with varimax rotation was conducted to assess the underlying structure for the 98 items of creativity. At first, six factors such environmental sensitivity, self-strength, intellectuality, individuality, curiosity and artistry were requested. Using varimax rotation means that the final factors will be as uncorrelated as possible with each other. As a result, the information explained by one factor is independent of the information in the other factors.

Throughout this analysis, items with initial values of less than 0.4 and those without loadings were discarded. After doing several steps, 36 items out of 98 items were eliminated because they had low or no loadings with any other factors. By taking out 36 items, the communalities were all above 0.4; it indicated that the relation between each item and other items is satisfactory. Given these overall indicators, factor analysis was conducted with 62 items.

After extraction, some of the factors were retained, and some were dismissed. After rotation, the first factor accounted for 17.024% of the variance, the second factor accounted for 9.427% of the variance, the third factor accounted for 5.326% of the variance and the fourth factor accounted for 3.932% of the variance.

Examination of the scree plot was shown in Figure1. The first factor was much larger than subsequent factors in terms of eigenvalue magnitude; eigenvalue of successive factors drop off quite drastically. Four factors were retained within the sharp descent, before eigenvalue level off. Based on the plot, it appears only four factors should be interpreted.



**Figure 1** Scree Plot of Eigenvalues for Items of the Creativity Scale

Each factor was named according to the construct of the items.

**Table 2** Factor Loadings

	Component			
	1	2	3	4
item 91	.703			
item78	.692			
item42	.676			
item63	.647			
item97	.620			
item56	.617			
item37	.593			
item80	.576			
item87	.572			
item94	.569			
item89	.567			
item2	.545			
item41	.542			
item84	.539			
item93	.538			
item25	.535			
item8	.529			
item6	.529			
item38	.515			
item58	.507			
item55	.504			
item95	.500			
item75	.491			
item3	.474			
item16	.465			
item92	.462			
item26	.462			
item44	.458			
item7	.458			
item81	.434			

	<b>Component</b>			
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
item21	.414			
item53	.413			
item83	.401			
item32		.625		
item65		.581		
item31		.560		
item18		.553		
item49		.540		
item51		.539		
item36		.525		
item52		.504		
item35		.463		
item30		.462		
item61		.459		
item33		.454		
item60		.453		
item47		.450		
item9		.428		
item22		.404		
item68			.650	
item73			.620	
item72			.597	
item71			.588	
item86			.579	
item77			.549	
item40			.535	
item79			.427	
item88				.650
item70				.643
item54				.617
item90				.545
item59				.424

Factor 1 was named as sensation of environmental conditions because a person who is open to other's ideas and related ideas to what can be seen, touched or heard and is sensitive to meaningful ideas. It contains 33 items and factor loadings are from 0.401 to 0.703. Second factor was named as self-belief according to the structure of the items as a person who has self-confidence in matching talents against other and resourceful, versatile, willing to take risks, desires to excel and organizational ability. It contains 18 items and factor loadings are from 0.404 to 0.625.

Factor 3 was named as imagination. This type of person has intellectual curiosity, imagination and enjoys challenging tasks dislikes doing things in a prescribed routine. It contains 8 items and factor loadings are from 0.427 to 0.650. Factor 4 was named as willingness and curiosity and factor loadings are from 0.424 to 0.650.

### Confirmatory Factor Analysis on Creativity

Confirmatory factor analysis (CFA) is a statistical technique used to verify the factor structure of a set of observed variables. In this study, CFA is used to test the hypothesis that a relationship between observed variables and their underlying latent constructs exists. The data of fit the models of creativity was examined in Table 3.

**Table 3** Goodness of Fit Indices for Proposed and Final Model of Creativity Questionnaire

Fit Index	Proposed	Final
RMSEA	0.044	0.042
CFI	0.805	0.921
TLI	0.798	0.901
IFI	0.806	0.917
CMIN/DF	2.391	1.984

Based on the Table, CFI and TLI did not reach the adequate value. So, the model was re-specified. According to Sun (2005), it is a good to remove the items with low  $R^2$  values (less than 0.3) from the analysis to remove the better model fit. After through the correlation of error terms, a  $\chi^2/df$  ratio less than 2 or 3 and a RMSEA less than 0.08 indicate an acceptable model. For CFI and TLI a value greater than 0.9 indicate an acceptable fit and a value greater than 0.95 indicates a good fit. The model fit indices of creativity with 59 items.

### Validity and Reliability of Creativity

#### Convergent Validity and Discriminant Validity of Creativity

Convergent validity is also an evidence to test construct validity. To establish convergent validity, composite reliability (CR) and average reliability extracted (AVE) should be used. AVE and CR values were computed by the formula using Microsoft Excel. Table 3 shows that the results of AVE and CR of creativity scale.

**Table 4** Construct reliability and validity of Creativity

	CR	AVE	SEC	SB	I	W&C
Sensation of environmental conditions	0.913	0.430	0.655			
Self-belief	0.831	0.412	0.621	0.641		
Imagination	0.813	0.401	0.058	-0.06	0.633	
Willingness and curiosity	0.801	0.393	0.058	-0.066	-0.018	0.626

The AVE values for the model range from 0.393 to 0.430. The CR values range from 0.801 to 0.913. The composite reliability (CR) value is greater than the average variance extracted (AVE). According to Fornell and David (1981), the AVE should be above 0.5 and however, the value of 0.4 is acceptable if AVE value is less than 0.5, but CR is higher than 0.6. Then, the convergent validity was achieved for this construct. Therefore, the creativity scale can be assumed that it was a valid instrument to measure creativity of the prospective teachers.

For discriminant validity, it was used to show that the construct is actually differing from one another empirically. The discriminant validity was evaluated with square root of AVE with correlations of latent construct. The diagonal numbers in bold letters are the square root of AVE value was greater than all the inter-latent factor correlations for all factors in the relevant rows and columns. The square root the AVE is higher than the correlations between constructs indicating there is discriminant validity (Fung, 2016).

### Reliability of Creativity

After the confirmatory factor analysis, the creativity scale consisted of four scale with 59 items. Table 5 shows that the reliability coefficient of each subscale for creativity.

**Table 5** Reliability coefficient of Creativity

Factor	Cronbach's Alpha
Sensation of environmental conditions	0.912
Self-belief	0.849
Imagination	0.870
Willingness and curiosity	0.801
<b>Total</b>	<b>0.812</b>

Based on Table 5, reliability coefficient of each subscale ranged from 0.801 to 0.912 and the reliability coefficient of creativity was 0.812. Thus, the creativity scale was reliable to measure creativity of prospective teachers.

In summary, the area of creativity is neglected sometimes in the psychology. "When learning is purposeful, creativity blossoms. When creativity blossoms, thinking emanates. When thinking emanates, knowledge is fully lit. When knowledge is lit, economy flourishes". This statement reiterate the importance of learning to the creative person. From this perspective, learning is connected to the ability of creative. Also, prospective teachers are the role model of Myanmar Education. So, the development of creativity scale will be helped to achieve the Myanmar Educational Policies.

### Discussions

According to the previous studies, it has been repeatedly asserted in numerous studies of creativity that those who are more creative tend to have higher levels of knowledge about the areas in which they are creative. The purpose of the Exploratory Factor Analysis and Confirmatory Factor Analysis were to develop and validate and efficient and direct measure of creativity scale.

## Conclusion

This study is intended to provide more through information about the connection between the creativity and learning of the student teachers. While a wide variety of definitions, conceptualizations, and means of assessment exist within the field of research, the development of this creativity scale can contribute to the creativity literature. Additional examination of the cognitive processes of the CPAC scale is also beneficial to the usefulness of the newly developed scale. The aim of the study is to inform the creativity for college students in order to provide a precise reference for creativity-related policy improvements for the education system and to assist college students themselves toward self-evaluation for understanding and further enhancing a self-centered creative orientation. Insight gained from this study may enable adult educators to improve existing learning situations as well as develop new, more effective programs for student teachers.

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