

## Investigating the Relationship between Creativity and Academic Achievement of Malaysian Undergraduates

Saeideh Bolandifar<sup>a\*</sup>, Nooreen Noordin<sup>b</sup>

<sup>a</sup>Department of Language Education and Humanities, Faculty of Educational Studies, University Putra Malaysia (UPM), Malaysia

\*Corresponding author: sabolandifar@yahoo.com

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### Abstract

The present study focused on investigating the relationship between creativity and academic achievement of Malaysian undergraduates who are studying TESL (Teaching English as a Second Language). Through random sampling, 100 students (46 males and 54 females) from different Universities in Malaysia were selected to participate in this study. As the research instruments, Cumulative grade point average (CGPA), and Nicolas Holt Creativity Test (NHCT) were used to measure the academic achievement and creative potential of students. Inferential statistics were utilized to analyze the data. The Pearson Correlation coefficient indicated a significant positive relationship between creativity and academic achievement of students. A significant gender differences were found between male and female students, their creativity and their academic achievement. Finally, the results of the study and their implications are discussed.

*Keywords:* Creativity; academic achievement; gender; undergraduate students

### Abstrak

Kajian ini menyelidik hubungan antara kreativiti dan pencapaian akademik pelajar Malaysia yang belajar TESL (Pengajaran Bahasa Inggeris sebagai Bahasa Kedua). Melalui persampelan rawak, 100 pelajar (46 lelaki dan 54 perempuan) dari Universiti yang berbeza di Malaysia telah dipilih untuk mengambil bahagian dalam kajian ini. Sebagai instrumen penyelidikan, terkumpul mata purata gred (CGPA), dan Nicolas Holt Kreativiti Test (NHCT) telah digunakan untuk mengukur pencapaian akademik dan potensi kreatif pelajar. Statistik inferensi telah digunakan untuk menganalisis data. Pekali Korelasi Pearson menunjukkan hubungan positif yang signifikan antara kreativiti dan pencapaian akademik pelajar. Satu perbezaan jantina yang signifikan didapati antara pelajar lelaki dan perempuan, kreativiti dan pencapaian akademik mereka. Akhir sekali, hasil kajian dan implikasinya dibincangkan.

*Kata kunci:* Kreativiti; pencapaian akademik; jantina; mahasiswa pelajar

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### 1.0 INTRODUCTION

Nowadays, education plays an important role in the success of students. According to Fathei (2006), each student has his own educational needs which are essential to be completed to achieve academic excellence. The academic achievement distinguishes between students and determines their accomplishment in their future work. Mahmoodiasl (2002) stated that educators and researchers are interested to find the effective factors which may influence the academic achievement in higher education. Discovering these factors, can help students to improve their abilities in education.

One of the predictors of academic achievement is cumulative grade point average. Numerous studies have been conducted to investigate the effects of undergraduates' cumulative grade point average on the academic success of these students. For example, Gelardi and Emby (2005), Hirsh and Peterson (2008), and Hong (2002) found significant positive correlation between cumulative grade point average and the academic achievements of students.

Creativity is a fundamental element in relation to education. Creative thinking helps students to try different concepts, different perceptions, and different points of views toward problems. Therefore, promoting the creativity skills of students has appeared as an important educational issue in several countries such as: Japan (Cave, 2001), and the United States

(Starko, 1995). In relation to advance the creativity, some researchers have tried to investigate the factors which influence creative performance like gender, ethnicity, and academic achievement (Baer, 1999; Runco, 2007; Chamorro-Premuzic, 2006). Many studies have investigated the correlation between creativity and academic achievement, but they obtained inconsistent results. For example, Ai (1999), Yamamoto (1964), Asha (1980), and Palaniappan (2007) stated that in their studies, creativity was hardly correlated with the academic achievement of students. In a study by Behroozi (1997) and Noori (2002), no significant relationship was found between these two variables. Kim and William (1993) and Marjoribanks (1976) concluded that creativity was not correlated to academic achievement. Furthermore, Palaniappan (2005) did not find a negative relationship between creativity and academic achievement of students.

According to Yong (1993), in Malaysia, numerous efforts are being made to promote the creative thinking of students. Teachers are motivated to apply methodologies which promote creative thinking skills and students are encouraged to be innovative. In order to apply the creative thinking, students need a framework to find themselves in a position where they should produce new ideas (Awang and Ramly, 2008). The relationship between creativity and academic achievement of undergraduate students had been investigated in previous studies (Naderi, Abdullah, Aizan, Jamaluddin, and Kumar, 2010), but the relationship between creativity and academic achievement of Malaysian TESL undergraduate students has not been established. Hence, the goal of this study is to examine the relationship between creativity and academic achievements of Malaysian undergraduate students who are studying TESL in three public Universities of Malaysia. More specifically, it focuses on the existence of differences between Malaysian male and female undergraduate students' academic achievements and their level of creativity. Comprehending the relationship between creativity and academic achievement of students can assist teachers to have more preparation toward the unexpected ideas of students and also to equip themselves with more supportive curricula which may help to develop the potentials of students. Therefore, this study attempts to answer the following research questions:

1. Is there a relationship between the academic achievement of Malaysian undergraduate students and their level of creativity?
2. Is there any significant difference between Malaysian male and female undergraduate students' (i) academic achievements and (ii) their level of creativity?

### 1.1 Academic Achievement

Academic achievement is such an unstructured term, and it contains so much that it is difficult to explain it sufficiently (Bentley, 1966). However, it is obvious that academic achievement includes various abilities and skills. He stated that for example, in the following two questions it is clear that different abilities or processes are needed for answering each question acceptably: 1) The founder of psycho analysis was (a) Jung; (b) Fromm; (c) Freud, and (d) Adler. 2) List as many reasons as you can why accurate knowledge about mental health will lead to a stronger, healthier community. Through utilizing these two questions the teacher is measuring different types of achievement. To answer the first question, the student should know or to be able to recognize, the one correct answer. He needs to eliminate the incorrect choices which are called convergent thinking. For answering the second question, the student needs to

move to different directions and none of the answers are correct or incorrect. This can be called a divergent direction of thinking.

According to Millar and Irving (1995), the concept of academic achievement is associated with the achievements of students which have been attained in any educational institution. Valencia (2002) stated that the problems of academic achievement are a central point for researchers, because the problems in the achievement of students predict school dropout. Many countries have conducted studies in order to investigate academic achievement in relation to other social, cognitive, and personal factors. They aimed to find some factors that improve the academic achievement of students. Psychological and demographic factors such as creativity and gender make a noticeable contribution to academic achievement (Lobel and Agami, 1993). For measuring the academic achievement, Shin (1971) employed Bloom's taxonomy of educational objective to make a taxonomic structure. Shin (1971) examined the contribution of creativity to the variance of achievement scores on the Bloom's taxonomy and understood that the variance for the last two categories of the taxonomy, Synthesis and Evaluation, were caused by the scores of creativity. According to Dasi (2001), it seems that creative individuals have better ability to function at higher levels of mental processes. Therefore, academic achievement of students is one issue that attracts the attention of researchers and educators to itself.

### 1.2 Cumulative Grade Point Average (CGPA) and Academic Achievement

In order to quantify the academic achievement of students, the grade point average has been used. There are three kinds of grade point average: a) semester grade point average (Zheng *et al.*, 2002), b) grade point average in major courses (Strage, 2000), and c) Cumulative grade point average (CGPA) (Strage, 2000). According to Strage (2000), grade point averages have been self-reported by students. He added that ensuring the respondents of the anonymity of their self-reported information can enhance the correctness of reported grades.

Some tests such as Achievement tests, Comprehensive Tests of Basic Skills, Collegiate Assessment of Academic Proficiency (CAPP), and Graduate Record Exam (GRE) have been utilized to measure the academic achievement of students. But Camara and Gary (2000) mentioned that Cumulative grade point average is a traditional measure of academic achievement which is still used greatly in schools and universities. Cumulative grade point average (CGPA) is a quite robust predictor of academic achievement at the level of graduate and postgraduate studies (Reisig and DeJong, 2005).

### 1.3 Creativity

A considerable amount of literature has been published on creativity (Miller, 2007; Charlton, 2009; Heinze *et al.*, 2009; Ivcevic, 2009; Yusuf, 2009). Based on what Torrance (1966) stated, creativity is a process of becoming sensitive to a difficulty, missing factors, and lacks in knowledge and so on; recognizing the problem; seeking for good solutions and making supposes. Hence, creativity emphasizes on the individuals' abilities to create ideas which are new. Others such as Kirton (2003) believed that creativity is related to adapting, developing or finding a novel application for an existing product. Therefore, creative thinking is believed to be related to the right brain which is characterized by processing the information in a direct and synthesis way (Torrance, Reynolds, and Ball, 1977). Weinberg (2005) emphasized that creativity needs hard work. It is a process which is original and valuable. Creativity should be seen as an

individual's property and that individual interacts with different systems. For instance, painters- such as Picasso or Braque- who create the Cubist painting were creative persons in their time, but now might be seen as less creative because their ideas are not counted as novel as before.

The systematic consideration of creativity is explained by Getzels and Jackson (1962) as happening in three overlapping periods. Each period has a dominating paradigm that starting with genius, then giftedness, and then originality. Creativity appears as a significant element of cognitive abilities consisting problem-solving, social and emotional well-being, and career success (Plucker *et al.*, 2004). According to Sternberg and Lubart (1996) creativity is the confluence of knowledge, motivation, thinking styles, intellectual activity, and surroundings.

In terms of education, creativity is a crucial element necessary for the learning process. According to Starko (1995), students could make information relevant by connecting previous knowledge and new knowledge in an individually meaningful format which is a creative process of learning. This process is related to the creativity of people. Some schools do not support students' creativity, and some of them actively suppress the expression of creativity. For example, some teachers are not well-equipped to promote, support, or evaluate creativity in their students (Torrance and Safter, 1986). Begheto (2009) mentioned that neglecting the unexpected ideas from students by their teachers are the most important reason which damage the creativity of students during schooling experience. Moreover, there are lots of theories and research which demonstrate that creative students often lose their creative abilities (Shaughnessy, 1991). On the other hand, based on what Isaksen and Treffinger (2004) stated, applying appropriate methods and curricula can promote creativity. Therefore, the educational system should be responsible for supporting and developing creativity in students in order to make them ready for a productive life in the community. Teachers should improve the potentials of students, so they can grow into creative adults.

#### 1.4 Creativity and Academic Achievement

Many researchers and Psychologists investigated the relationship between creativity and academic achievement of students (Toth and Baker, 1990; Powers and Kaufman, 2004; Chamorro-Premuzic, 2006; Onda, 1994; Runco, 2007; Kaboodi and Jiar, 2012). First, Getzels and Jackson (1962) presented the results of their study on the role of creativity in school achievement. According to Ai (1999), their investigation had a significant influence on psychology in the field of education which cause lots of investigations to comprehend what the nature of creativity was like. They indicated that through conducting a standardized achievement test, a group of students whose intelligence was in the lower 80% of their school and whose creative potential was in the top 20% performed as well as a group of students whose intelligence was in the top 20% and whose creativity was in the lower 80%, in spite of a 23-point difference in IQ. Torrance (1962) had conducted eight studies in related to the study of Getzels and Jackson (1962) and six of them verified their results. Ai [11] also examined the relationship between creativity and academic achievement. In his study, 2,264 students (38% boys and 62% girls) were selected randomly from 68 schools. He used three types of creative tests- the Torrance Test of Creative Thinking (TTCT), the Abedi-Schumacher Creativity Test (CT), and the Villa and Auzmendi Creativity Test (VAT)- in his study. The findings of the study demonstrated the correlation between creativity and academic achievement of students. In addition, other researchers mentioned that creativity is related to academic achievement (Mahmodi, 1998; Karimi, 2000). In a recent study

by Karimi (2000) on the secondary school students, the relationship between creativity, sex and academic achievement was investigated. The result of the study displayed a relationship among these variables. Boys revealed higher creativity than girl students. Wang's (2011) comparative study revealed a significant positive relationship between creativity and academic achievement of both nations (student teachers in Taiwan and student teachers in the United States). In addition, Powers and Kaufman (2004) displayed significant correlations between creativity and the Graduate Record Exam (GRE) test scores which is a commonly recognized indicator of future academic performance. According to Chamorro-Premuzic (2006), deciding whether the creativity and achievement test are positively or negatively related are based on the nature of that test. He investigated the relationship between creativity and achievement tests of 307 university students and came to this conclusion that there is a positive correlation between creativity and the performance of oral exams and collaborative projects. On the other hand, creativity is correlated negatively to the grades of multiple-choice and essay-type exams.

According to Ai [11], previous studies had inconsistent results about the relationship between creativity and academic achievement. Toth and Baker (1990) stated that interfering the high creative ability with convergent thinking skills of students may hinder them from obtaining academic success within the time limitation of a traditional classroom. For example, in a study by Edwards and Tyler (1965) on the 181 ninth grade students, no relationship was found between creativity and school achievement. In a study on sex differences of high school students in Shiraz, Iran and the types of relationship between creativity and academic achievement of them, Noori (2002) used an Abedi questionnaire of creativity and Cumulative Grade Point Average (CGPA) for academic achievement in order to measure the relationship between creativity and academic achievement of students. The result was different for the two sexes, but no significant relationship was found between creativity and academic achievement. In another major study on business students, Olatoye, Akintunde, and Yakasai (2010) demonstrated that creativity did not significantly predict the academic achievement of students. They reported that in their study, a negative insignificant relationship was found between creativity and CGPA scores of students. Furthermore, in their analysis of gender differences in creativity and academic achievement, they concluded that none of these variables (creativity and academic achievement) were sensitive to gender.

Some researchers have obtained a low correlation between creativity and academic achievement. In a study by Aitken Harris (2004), 404 adult participants fulfilled some scales related to personality, intelligence and creativity. The results demonstrated that achievement presented small to moderate positive correlation with creativity scales. Karimi (1998) had conducted a research on secondary school students in Shiraz school in Iran and found a low relationship between creativity and academic achievement of those students. Another study on the Federal Republic of Germany and Switzerland revealed that correlations between creativity scores and grades were as low as 0.09 (physics) and 0.15 (art) (Krause, 1977).

In conclusion, Behroozi (2006) stated that being aware of the relationship between creativity and academic achievement is an important issue in education and teaching process, because there are few studies with inconsistent findings on the relationship between these two variables among students.

### 1.5 Creativity, Academic Achievement, and Gender

The background characteristics of an individual have a great effect on his/her behavior (Ai, 1999). According to Fennema and Carpenter (1998), among those background characteristics, gender is one of the most significant variables in educational studies. There are lots of studies that have been conducted on the subject of academic achievement and gender (Hosenfeld *et al.*, 1999; Barkatsas *et al.*, 2009; Penner and Paret, 2008) as well as creativity and gender (Ai, 1999; Naderi *et al.*, 2010; Palaniappan, 2007b).

Some studies indicated that gender is one of the most important characteristics in academic achievement (Ai, 1999; Fennema and Carpenter, 1998; Naderi *et al.*, 2010). According to David (2001), in recent years, one of the areas of study that has been especially dynamic is the differences in scoring that correlate with gender. Possibly the most difference in scoring are happening in the area of college aptitude, where the scores is supposed to predict the performance of college-level applicants. In a study by Noori (2002) on sex differences in relation to creativity and academic achievement, 306 high school students (150 boys and 156 girls) were studied. The findings indicated a significant difference in academic achievement of boys and girls. The girls' academic achievement was higher than boys and it was significant ( $p < 0.01$ ). In addition, MehrAfza (2004) conducted a study on 384 high school students (boys and girls) in Tabriz- Iran. She demonstrated that there was a difference in academic achievement of girls and boys and girls obtained higher achievement than boys.

Moreover, there are some studies which investigated the gender differences and creativity, because it is a controversial issue among researchers. According to Charyton and Snelbecker (2007), males and females described their images of creativity differently. In a study, Palaniappan (2000) examined 101 males and 69 females in order to consider gender differences in creativity and found that males achieved higher scores on this issue. Also, Palaniappan (2007b) investigated Malaysian high school students (142 boys and 154 girls) and found that boys obtained higher mean scores on creativity test. In addition, Sajjadi-Bafghi (2007) studied 886 Iranian students (407 boys and 479 girls) on creativity. He found that boys' scores were significantly higher than the girls' scores. In their study, Charyton, Basham, and Elliott (2008) mentioned that the level of creativity between males and females is much the same but they also came to the conclusion that the most renowned creative individuals are usually male.

Other researchers have found opposite results. For instance, Baer (1999) reviewed most of preceding studies and declared that women and girls tend to be more creative than men and boys. Warren and Luria (1972) found that girl students in early adolescence had higher level of creativity than boys. Additionally, Wang (2011) conducted a study on student teachers in Taiwan and the United States in order to examine the gender differences in creativity of these two nations. He found that in Taiwan, female student teachers showed higher scores of creativity than males. But, In the United States, no significant gender differences were found. In another study by Chusmir (1986), no significant differences were found between males and females and their level of creativity. Mehrafza (2004) examined gender differences and creativity through using Abedi's questionnaire of creativity and reported that no differences were found in the overall creativity scores of students. Moreover, Shi, Xu, Zhou, and Zha (1999) mentioned that regarding creativity, there was no gender difference in their study.

Although many studies have been conducted on gender differences and creativity or gender differences and academic

achievement, but no studies have been done on Malaysian TESL undergraduate students. Therefore, this study aims to investigate these two issues in the context of Malaysia.

## 2.0 METHOD

To determine the existence of the relationship between creativity and academic achievement of undergraduate students, a correlational design was utilized in the current study.

### 2.1 Participants

The subjects for this study were 100 (46 males and 54 females) Malaysian undergraduate students of three public universities of Malaysia. All of these students were majoring in TESL. Simple random sampling was used to select the participants. The age of participants ranged from 18-24 years old.

### 2.2 Instrumentation

For collecting data, two instruments were used in this study:

1. Student Cumulative Grade Point (CGPA) Information: In order to achieve the goals of this study, Cumulative Grade Point Average (CGPA) was utilized as a representative of academic achievement of students. Cumulative Grade Point Average (CGPA) was calculated by dividing the total number of grade points obtained by the total number of credit hours attempted. Some researchers had used this instrument in their studies and they believed that it was an acceptable one for measuring the academic achievement (Parker, 1979; Wilson, 1968; Palaniappan, 2007a; Naderi *et al.*, 2010; Noori, 2002). They stated that the range of grade points is from zero to four. The best grade point is 4, while the lowest grade point is zero. The following Table 1 indicates the range of grade points in Cumulative Grade Point Average (CGPA).

**Table 1** Cumulative Grade Point Average Students (CGPA)

Result		Level
(3.5-4.0) A	85-100	High Level
(3-3.49) B	75-84.99	Good Level
(2.49-2.99) C	60-74.99	Satisfactory
(2-2.48) D	50-59	Weak
(1.99-0) F	49.99 and below	Fail

2. Nicolas Holt Creativity Test (NHCT): Each participant was examined using a Nicolas Holt Creativity Test (NHCT) to measure the level of creativity of undergraduate students. This instrument was a twenty-nine-item scale that developed by Nicolas Holt in order to measure the level of creativity of individuals in the areas of fluency, originality, flexibility, and elaboration of traits, among others. The validity and reliability of the instrument is investigated (Olatoye, Akintunde, and Yakasai, 2010). Through a test re-test method, they found a reliability of 0.88 for the instrument (NHCT). Nicolas Holt Creativity test was scored on a five-point likert format type continuum scale which ranged from one to five. The five options of this instrument are: 1) "not so true of me", 2) "not true of me", 3) "averagely true of me", 4) "true of me", and 5) "fully true of me".

### 2.3 Procedure

The questionnaires were distributed to the potential participants, explaining the purpose of the study and assuring them that their responses were anonymous, voluntary, and confidential. Ten minutes were required to answer the questionnaires. First, the respondents should have mentioned their Cumulative Grade Point Average (CGPA), and then they had to mention their opinions about their level of creativity through circling the numbers which were designed from one to five.

The response rate was 100%. It meant that all the students filled the questionnaires completely. The Statistical Package for the Social Sciences (SPSS) version 18 was used to analyze the obtained data.

### 3.0 RESULTS

In order to answer the two research questions of the study, the inferential statistical analysis (Pearson Correlation Coefficient and Independent-sample t-test) was used.

#### 3.1 Results Related to Research Question 1

Pearson Correlation Coefficient was conducted to determine whether there is a significant relationship between creativity and academic achievement of participants. Table 2 shows the test results from the analysis of the data.

**Table 2** Pearson correlation coefficient- creativity and academic achievement

		Academic Achievement
Creativity	Pearson Correlation	.811**
	Sig. (2-tailed)	.000
	N	100

\*\* Correlation is significant at the 0.05 level (2-tailed)

Based on above Table 2, the results of the test exhibited a significant level of  $p < 0.05$  for the correlation between creativity and academic achievement of students. A significant positive relationship was found between creativity and Cumulative Grade Point Average (CGPA) scores ( $r = .811$ ,  $p < 0.05$ ). It means that the increase of one variable is correlated with the increase of another one. Therefore, participants who had more creativity indicated higher CGPA.

#### 3.2 Results Related to Research Question 2

For determining any significant differences between male and female students and their creativity and also their academic achievement, an independent-sample t-test at the 0.05 significance level was used. The following Table 3 indicates the results of the t-test from the analysis of data.

**Table 3** Independent-Sample T-Test results for gender differences in creativity and academic achievement

	Gender	N	Mean	SD	df	t	p
<b>Creativity</b>	Male	46	90.11	7.14	98	4.46	.000
	Female	54	99.61	8.25			
<b>Academic Achievement</b>	Male	46	2.30	0.39	98	0.58	.000
	Female	54	2.99	0.43			

As Table 3 shows, a significant difference were found between male and female students and their creativity ( $t(98) = 4.46$ ,  $p < 0.05$ ). In addition, the difference between male and female students and their academic achievement was significant ( $t(98) = 0.58$ ,  $p < 0.05$ ). The creativity and academic achievement of females were higher than males. The obtained results indicated that both creativity and academic achievement were sensitive to gender.

### 4.0 DISCUSSION

The first purpose of this study was to determine the existence of the relationship between creativity and academic achievement of Malaysian TESL undergraduate students. This study produced results which confirm the findings of a great deal of the previous works in the area of creativity and academic achievement. A significant positive relationship was obtained between creativity and Cumulative Grade Point Average (CGPA) scores of students which was the representative of academic achievement in this study ( $r = .811$ ,  $p < 0.05$ ). This finding displayed that students with more creativity had higher CGPA scores that led to higher academic achievement. The finding of this study was consistent with the results of previous ones. In a study by Karimi (2000) a relationship was found between creativity and academic achievement. Powers and Kaufman (2004) found significant correlations between these two subjects.

The current study showed statistically significant differences between male and female TESL undergraduate students and their creativity ( $t(98) = 4.46$ ,  $p < 0.05$ ). Furthermore, based on the findings of the Independent-Sample t-test, a significant difference was attained between the male and female students and their academic achievement ( $t(98) = 0.58$ ,  $p < 0.05$ ). The findings indicated that these two subjects were not distributed equally among male and female students. In both cases, female students displayed a higher degree than male students. The results of the present study supported the previous research findings about gender differences, creativity, and academic achievement. Noori (2002) investigated gender differences in creativity and academic achievement and found that creativity and academic achievement of females were higher than males. Also, in a study by MehrAfza (2004) on high school students, girls demonstrated higher academic achievement than boys. Baer (1999) and Wang (2011) conducted a study on gender differences and creativity and found that female students had a higher level of creativity than male students.

However, the finding of this study for gender differences in creativity and academic achievement was inconsistent with the earlier ones. For example, Naderi *et al.* (2010) illustrated that males are better than females on some components of creativity. Palaniappan (2000) examined gender differences in creativity and found that males gained higher scores on creativity. Also, Palaniappan (2007b) and Sajjadi-Bafghi (2007) found the same results in their studies. No gender differences were reported in a study by Goldsmith and Matherly (1988) on the creativity of 118 college students.

### 5.0 CONCLUSION

This study indicated that a significant positive relationship was found between creativity and academic achievement of Malaysian TESL undergraduate students. Moreover, a significant gender differences were found in their creativity and their academic achievement. Female students reported higher creativity and academic achievement than male students. This study is limited

to the population studied and the results of it may be changed by using different participants from different nations and universities. Hence, more research on this topic needs to be undertaken before the correlation between creativity and academic achievement is more clearly understood. Through conducting similar studies with larger sample who are studying in different field of studies from various universities in Malaysia, the results of this study will be verified and will become more useful in the education community. Moreover, results achieved from other instruments used to measure creativity and academic achievement need to be compared with the outcomes from instruments utilized in this research (NHCT and CGPA).

In conclusion, creativity is needed for academic achievement which is not emphasized in most educational systems. In order to improve the academic achievement of students, their creativity should be strengthened. For developing creativity among students, policy makers, and administrators should provide separate courses which are related to creative thinking. Curriculum should be modified in order to provide classes which cause students think creatively about topics through recognizing, understanding, and analyzing the knowledge in new environments. Teachers also should be trained to know the value of creativity; therefore, use methodologies in their classes which reinforce the creativity of students. According to Karnes, McCoy, Zehrbach, Wollersheim, Clarizio, Costin, and Stanley (1961), educational programs should provide teaching techniques in order to activate the divergent and convergent thinking of students which are significant for encouraging creative thinking. Providing individual activities based on problem solving and also group activities can increase both creative thinking and academic performance of students.

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