




## PRACTICING CREATIVE THINKING AND ITS RELATION TO ACADEMIC ACHIEVEMENT

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**Abstract.** Creativity is essential for survival and it is the path to progress and prosperity. Their creativity, innovation, invention and leadership measure the progress and development of nations. Creative thinking is one of the finest and highest skills and abilities that should be acquired by students in all different academic levels. The main objective of this study is to disclose the extent of practicing creative thinking and its relationship to academic achievement among students of the Jordan University of Science and Technology. The study was conducted on a sample of 1159 male and female students, who were chosen randomly. The study involved the following main question: To what extent are students of Jordan University of Science and Technology practicing creative thinking? It also contained three hypotheses: 1) There is a significant difference of practicing creative thinking among the students of Jordan University of Science and Technology due to gender; 2) There is a significant difference of practicing creative thinking among students of Jordan University of Science and Technology due to academic year; 3) There is a significant correlation between practicing creative thinking among students of Jordan University of Science and Technology and academic achievement. The results of the study indicated that students of Jordan University of Science and Technology are practicing creative thinking at a moderate level reaching 2.96 at Likert scale. Moreover, it revealed that there is a statistically significant difference in the level of practicing creative thinking due to gender favoring male students. A close relationship between the level of practicing creative thing and academic achievement was found, where 20% of the research sample having high academic achievement showed moderate level of practicing creative thinking.

**Keywords:** academic achievement, creative thinking, flexibility, fluency, higher education, originality, problem-solving.

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## Introduction

Creativity, innovation, invention, and leadership measure the progress and development of nations. Among others, creativity is considered as one of the essential skills that is required by the 21st century (Mishra & Mehta, 2017; Ananiadou & Claro, 2009). Moreover, creativity is regarded as a core competence for employees in a continuous evolving world, and a way to create a sustainable value (George, 2008). It is closely related to problem solving, critical thinking and reflective thinking (Facione, 1990). However, creativity has distinguishing features, such as originality, novelty, uniqueness, effectiveness, meaningfulness, and meeting task constraints (Gajda, 2016; Safadi, 2015).

The most important creative thinking skills and capabilities, which were assessed by different researchers include originality, fluency, flexibility, elaboration, sensitivity to problems solving (Jarwan, 2002). Originality is the most closely-related skill to creativity, and means novelty and uniqueness. Fluency is the ability to generate large number of alternatives, ideas, problem-solutions, and uses in response to a certain trigger in a fast and easy way. On the other hand, flexibility is the ability to generate diverse, unexpected ideas, and to direct the mode of thinking in response to the trigger. Elaboration can be defined as the addition of details to the idea or solution of the problem to enrich and implement it. Creative people are sensitive and aware of problems, needs, and elements of weakness in the situation.

Creative thinking is a mode of thinking that enables individuals to use their imagination for the purpose of ideation, raising hypotheses and questions, to work out alternatives, to assess their and others ideas, processes and products (Kampylis & Berki, 2014). Creative thinking is necessary for survival, and long-lasting success of individuals, companies, industries, and nations (Ford & Gioia, 2000). Creativity is built on knowledge and practice, enabling individuals to achieve better results in challenging circumstances (Ananiadou & Claro, 2009). Moreover, creative thinking improves individual abilities, such as metacognitive, inter- and intra-personal, problem-solving skills, and helps develop identity, academic achievement, future career success, and social engagement (Beghetto, 2010). Hence, creativity can be developed and enhanced by learning and applying creative strategies, and by converting information and experiences gained from training into new knowledge and skills (Sun et al., 2020; Perry & Karpova, 2017; Hsiao et al., 2014; Yasin & Yunus, 2014; Dweck, 2016).

Creative people have the ability to devise new ways to solve problems and meet challenges. They are able to find new ways to accomplish their assigned tasks, solve their problems and challenges, and thus bring a new and unusual perspective to their work (Jarwan, 2013). Hence, this contributes to the evolution of organizations and companies to take a more productive approach. Creative thinking skills are therefore a hallmark for which employers are looking in this era (Majdoubi, 2020; Al-Rubaie, 2020; Nurhamidah et al., 2018).

Generally, universities are accused for producing graduates who lack sufficient ability or experience in creativity and innovation (Gube & Lajoie, 2020). Therefore, countries, especially developing and poor ones, and through their different related organizations, such as the Ministry of Education and the Ministry of Higher Education, should give a wide space in the educational environment to gain and practice creative thinking freely. Creative thinking is one of the finest and highest skills and abilities that should be ascertained by students in all different educational levels (Akpur, 2020; Gajda, 2016; Safadi, 2015). Creative thinking

becomes a life approach that helps students forming deep understanding of various problems of life, enabling them solving such problems in creative and innovative ways, and to adapt to the changes of time, knowledge and technological development accompanying it (Al-Aqbawi, 2019). Moreover, it contributes to the development of various human skills and abilities, such as the ability to analyze, criticize, link, and apply. A study carried out by Akpur (2020) on a total of 227 first year university students, Istanbul, Turkey, showed a positive correlation among reflective thinking, creative thinking, and critical thinking. Moreover, all of these parameters affected academic achievement in a positive and significant way. Kim (2020) found a positive correlation between the creativity of engineering students and academic performance. In addition, it is found that female students are potentially more creative compared to male students. A study on 153 undergraduate students in Malaysian universities revealed that aspects of creativity are related to academic achievement for both male and female students (Naderi et al., 2010). To find the relationship between learning performance and each of creative thinking skills and critical thinking skills, a study was carried out by Fatmawati et al. (2019) on a sample of 30 students (fourth-semester), Department of Biology Education, IKIP Mtataram, Indonesia. It was revealed that there was a correlation between learning performance and both critical and creative thinking skills. The study revealed a correlation between learning achievement and critical and creative thinking skills. The relation between self-perceived creativity and entrepreneurial willingness was investigated among 559 university students from Spain (Laguía et al., 2019). Family and university support for creativity, and joining a creativity course are important predicting factors of self-perceived creativity. Moreover, teaching creativity contents and practice enriches entrepreneurship programmes. To address the development of students' creativity throughout university education, Cheung et al. (2006) conducted a study on a sample of 859 university students in Hong Kong. The study measured divergent thinking using five tasks to excavate the students' creative ideas, which led to scores of creative thinking skills. Results revealed a trend of monotonic decrease in creativity along the years of study at the university. Moreover, general superiority of verbal creativity was found among students of humanities and social sciences, whereas business students had the highest scores on self-assessed creative traits and products. Naderi et al. (2010) studied the effects of creativity, age and gender as predictors of academic performance. The study sample consisted of 153 Iranian students in Malaysian universities.

Creative thinking is now considered as one of the most important skills and abilities that graduate students must possess (Gube & Lajoie, 2020; Al-Maliki & Al-Mana, 2018). Development of students' creativity is one of the major challenges of modern higher education (Mynbayeva et al., 2016). The World Declaration on Higher Education called for a number of important principles regarding creativity in higher education, such as the development of curricula, teaching-learning, and research should be in a way that guarantees continuous fostering of creative thinking at every grade level.

In Jordan, the studies that assess the extent of practicing creative thinking among universities' students are absent or very limited. Moreover, creativity and innovation have been adapted at the national level as a road for socioeconomic development and unemployment alleviation. The results of this study represents a baseline study for decision-makers to improve the university environment to enable students to practice creative thinking. Therefore,

we seek through this study to answer a crucial question: To what extent are students of Jordan University of Science and Technology (JUST) practicing creative thinking?

We also seek to prove the following important hypotheses: 1) There is a significant difference of practicing creative thinking among the students of JUST due to gender; 2) There is a significant difference of practicing creative thinking among the students of JUST due to academic year; 3) There is a significant correlation between practicing creative thinking among the students of JUST and academic achievement.

## 1. Material and methods

### 1.1. Research sample

A random sample of 1159 students registering for the summer semester 2019–2020 was chosen for the purpose of this study. The number of male students was 397 (34.3%), whereas the number of female students was 735 (63.4%). Based on the academic year, the sample of the study was classified: first-year students represented 569 (49.1%) of the study sample; second-year students account for 302 (26.1%); and the other years constituted 256 (22.8%) of the study sample. The grade point average (GPA) for the last two semesters was also obtained for all members of the target study sample. The age of the students is in the range of 18–22 years. The study disciplines of the students cover basic sciences (physics, mathematics, chemistry, biotechnology), engineering, medical sciences, agriculture, pharmacy, veterinary medicine.

It is worth mentioning that the study was carried out during COVID-19 pandemic, where learning activities were carried out via e-learning *Moodle* using different types of meetings platforms such as *Microsoft Teams*, and *Zoom Video Communications*. This might have negative impacts on the level of practicing creative thinking by the university students.

### 1.2. Building and implementing the study tool

So as to achieve the aims and objectives of the study, a study tool (questionnaire) was developed by examining many scientific studies that dealt with the nature of creative thinking, and its components: such as originality, fluency, flexibility, sensitivity to problems, enrichment the details.

Creative thinking is closely related to the developmental stage of the university student that is acquired through multiple interaction with multiple and different situations and experiences. This is mainly based on the developmental psychology, cognitive psychology, and the nature of mental processes practiced by the students (Jaber, 2018; Al-Halaq, 2017; Al-Atoum & Aljrah, 2017; Judkins, 2017; Jarwan, 2002; Majid, 2008). In addition, reviewing a number of published measures and questionnaires that dealt with the nature of creative thinking and its relationship to the different developmental stages have been carried out (Al-Turk & Al-Qudah, 2017; Al-Assaf, 2013; Rule et al., 2012; Al-Haddabi et al., 2011; Ayasrah & Hamadneh, 2010; Saadh et al., 1996; Guilford, 1967, 1988; Jarial, 1980; Torrance, 1966, 1969).

The creative thinking scale building went through a number of steps and stages:

- Relying on standards and specifications drawn from educational and psychological literature, a list of phrases that reflect the practice of creative thinking has been prepared;

- The paragraphs of the scale were formulated in an initial form of 52 statements. These were presented to a group of faculty members in Jordanian universities, especially in the faculties of education, in order to ensure the apparent validity of the scale and the validity of the content, by expressing their observations, suggestions and amendments about the statements in terms of their suitability for measuring creative thinking, their linguistic integrity, and the suitability of statements to the study sample. According to the feedback from the arbitrators, some paragraphs were kept without modification, some of them were reformulated by simplifying them and replacing some words that were not clear in terms of meaning and significance, and (12) statements were deleted based on the opinions (80%) of the arbitrators, reducing the number of paragraphs of the scale to 40 statements;
- The Likert scale was applied to measure the total score of the statements based on each dimension. It is a five-fold scale: always, often, sometimes, rarely, never. The weighted arithmetic mean of the scale was determined and presented in Table 1.

The questionnaire used in its final form in this study consisted of two dimensions.

The first dimension contained demographic data, such as gender, academic year, and GPA. The second dimension included one major variable: To what extent are students of JUST practicing creative thinking. This dimension consists of forty statements. The following is a sample of these statements:

- I suggest several ideas, on a topic, within few minutes;
- I ask a lot about what I watch;
- I check the accidents that happen around me;
- I enumerate various uses of things;
- I describe the components of the new things;
- I change the types of questions I am asking;
- I offer different ideas from the ideas of others;
- I choose games free of restriction;
- I switch the words of the songs and the chants that I hear;
- I prefer dealing with new things than others;
- I detail the results I discover;
- I offer many details on the fictional things.

Table 1. Weighted average of Likert scale used in the present study (source: created by authors)

Scale	From	To
Always	1	1.79
Often	1.80	2.59
Sometimes	2.60	3.39
Rarely	3.40	4.19
Never	4.20	5

### 1.3. Reliability and stability of scale used

It refers to the judgment on the virtual scale related to its words' clarity and meaning regarding the second dimension of the study tool. Some experts in creative thinking, who indicated the appropriateness of the proposed study tool for the test by revising some statements, carried this out.

Additionally, the test-retest method was carried out where a sample was taken from outside the study sample (30 students) and from the study sample (30 students) and subjected to the scale two times with four weeks period.

Table 2 shows the results of the test-retest application, where the correlation value of the scale phrases ranged between 0.931 and 0.938, and reached 0.935 for the whole scale. These values are considered appropriate for the purpose of the study.

Table 2. Retest method data (re-test) for the creative thinking scale (source: created by authors)

	Scale mean if item deleted	Scale variance if item deleted	Corrected item – total correlation	Cronbach's alpha if item deleted
Sex	123.74	346.160	0.155	0.935
Academic year	123.17	332.759	0.427	0.934
Achievement	121.19	350.618	0.075	0.938
Q1	121.94	331.785	0.590	0.932
Q2	121.94	335.824	0.414	0.934
Q3	121.72	335.168	0.424	0.934
Q4	121.92	335.379	0.487	0.933
Q5	121.81	332.848	0.539	0.933
Q6	121.94	339.054	0.287	0.935
Q7	122.00	330.962	0.629	0.932
Q8	122.09	331.202	0.542	0.933
Q9	122.00	330.538	0.585	0.932
Q10	122.09	329.087	0.611	0.932
Q11	121.83	330.451	0.592	0.932
Q12	122.04	342.229	0.202	0.935
Q13	122.17	332.913	0.455	0.933
Q14	121.72	339.861	0.372	0.934
Q15	122.02	329.211	0.640	0.932
Q16	122.68	343.453	0.125	0.937
Q17	122.49	326.409	0.525	0.933
Q18	121.98	332.865	0.514	0.933
Q19	122.09	331.702	0.596	0.932
Q20	122.17	339.528	0.277	0.935
Q21	122.02	330.365	0.689	0.932
Q22	122.19	322.618	0.640	0.932

End of Table 2

	Scale mean if item deleted	Scale variance if item deleted	Corrected item – total correlation	Cronbach's alpha if item deleted
Q23	122.36	330.388	0.515	0.933
Q24	122.62	330.547	0.476	0.933
Q25	122.23	333.602	0.435	0.934
Q26	121.77	334.179	0.482	0.933
Q27	122.02	328.480	0.686	0.932
Q28	121.89	331.948	0.560	0.933
Q29	122.00	326.654	0.697	0.931
Q30	122.11	327.179	0.686	0.931
Q31	121.72	332.207	0.538	0.933
Q32	122.47	329.908	0.549	0.933
Q33	122.36	331.234	0.478	0.933
Q34	122.08	335.687	0.360	0.934
Q35	122.04	329.652	0.656	0.932
Q36	121.92	335.379	0.487	0.933
Q37	121.75	339.343	0.366	0.934
Q38	122.13	331.348	0.593	0.932
Q39	121.74	333.313	0.539	0.933
Q40	121.83	332.221	0.610	0.932
Total				0.935

Moreover, Cronbach's alpha equation was applied to measure the stability of the study tool by extracting the stability of the used scale in the internal consistency method (Table 3). The results revealed the following: the value of Cronbach's alpha for the items of the creative thinking scale was in the range of 0.918–0.924. It reached for the scale as a whole 0.921. This is supported by Sekaran (1984, p. 352), who stated that if the Cronbach's alpha exceeds 60%, the test achieves the stability requirements, the validity of scale, and the reliability of data.

Table 3. The values of Cronbach's alpha for the items of the creative thinking scale (source: created by authors)

	Scale mean if item deleted	Scale variance if item deleted	Corrected item – total correlation	Cronbach's alpha if item deleted
Sex	126.03	290.648	0.003	0.923
Academic year	125.57	288.600	0.043	0.924
Collection	123.72	284.132	0.183	0.923
Q1	124.28	279.175	0.503	0.919
Q2	124.28	278.339	0.435	0.920
Q3	124.09	278.774	0.483	0.919
Q4	124.21	277.926	0.515	0.919

End of Table 3

	Scale mean if item deleted	Scale variance if item deleted	Corrected item – total correlation	Cronbach's alpha if item deleted
Q5	124.13	277.042	0.505	0.919
Q6	124.48	279.934	0.338	0.921
Q7	124.25	277.273	0.529	0.919
Q8	124.26	277.977	0.451	0.920
Q9	124.37	275.722	0.537	0.919
Q10	124.34	275.816	0.559	0.919
Q11	124.03	278.902	0.497	0.919
Q12	124.22	278.127	0.493	0.919
Q13	124.52	277.082	0.417	0.920
Q14	124.19	281.764	0.362	0.920
Q15	124.21	277.852	0.527	0.919
Q16	125.28	281.891	0.233	0.922
Q17	124.83	279.046	0.309	0.922
Q18	124.26	279.782	0.399	0.920
Q19	124.45	274.530	0.598	0.918
Q20	124.44	275.122	0.505	0.919
Q21	124.35	274.440	0.616	0.918
Q22	124.35	276.694	0.441	0.920
Q23	124.68	275.083	0.510	.9190
Q24	124.83	276.196	0.379	0.921
Q25	124.32	279.789	0.387	0.920
Q26	124.16	277.923	0.473	0.919
Q27	124.30	276.310	0.557	0.919
Q28	124.24	274.428	0.586	0.918
Q29	124.18	275.551	0.566	0.919
Q30	124.36	275.865	0.559	0.919
Q31	124.22	276.493	0.508	0.919
Q32	124.63	275.878	0.486	0.919
Q33	124.80	278.074	0.380	0.920
Q34	124.51	275.795	0.468	0.919
Q35	124.43	276.313	0.549	0.919
Q36	124.33	276.115	0.526	0.919
Q37	124.23	278.514	0.458	0.920
Q38	124.33	276.498	0.544	0.919
Q39	124.01	279.040	0.461	0.920
Q40	124.16	276.201	0.553	0.919
Total				0.921



### 1.4. Statistical tests

To answer the main study question, and to prove alternative hypotheses, statistical analyses and tests were performed on the collected data such arithmetic means, standard deviation, independent samples test, t-test, and one-way analysis of variance (ANOVA) test, Scheffé method using the statistical analysis software SPSS.

## 2. Results and discussion

In the following paragraphs, the results of the study will be presented and discussed.

*First:* to answer the fundamental question raised by the study: To what extent are students of JUST practicing creative thinking?

The means and standard deviation of students' responses to the components of the questionnaire, which consisted of 40 statements, were calculated. Results revealed that the average and standard deviation of scores of all statements reached 2.96 and 0.59, respectively. It can be concluded that the average of students' answers to the indicators on practicing creative thinking by JUST students was of a moderate degree based on Table 1. This can be attributed to several reasons:

- School curricula in Jordan do not foster creative thinking skills, since they rely on traditional education;
- Students do not receive sufficient support from their families as well the surrounding community to enhance and practice creative thinking;
- University curricula in Jordan are traditional that depend on delivering knowledge using traditional teaching methods and activities. University regulations lack clear and well-defined program that does not help developing creative thinking;
- Old fashion infrastructure that does not help enhancing creative thinking;
- Insufficient financial funding.

The results of this study agree with those reached by other studies that indicated the existence of different levels in the degree of creative thinking practice among their samples (e.g. Ismael, 2019; Mynbayeva et al., 2016; Naderi et al., 2010).

*Second:* There is a significant difference of practicing creative thinking among the students of JUST due to gender.

Table 4. T-test for independent samples among Jordan University of Science and Technology students due to gender (source: created by authors)

	Levene's test for equality of variances		T-test for equality of means						
	F	Sig.	T	Df	Sig. (2-tailed)	Mean difference	Std. error difference	95% confidence interval of the difference	
								Lower	Upper
Equal variances assumed	5.412	0.020	-0.857	1130	0.392	-0.026	0.030	-0.084	0.033
Equal variances not assumed			-0.823	722.325	0.411	-0.026	0.031	-0.087	0.035

The t-test was applied to evaluate differences according to gender (Table 4). The results indicated that there is an equity in variance between male and female students' answers corresponding to practicing creative thinking. This was confirmed by the results of the Levene's test for equal contrast. Moreover, t-test results showed that there were statistically significant differences in practicing creative thinking among male and female students with a statistical significance level of (0.41) which is greater than (0.05). These differences also came in favor of males, with an average calculation of (3.02). In general, students are able to practice creative thinking, especially if the suitable environment is made available through the different age stages. Teaching and training students on practicing creative thinking, critical thinking, problem solving, and other thinking skills should begin from the home, kinder gardens, and schools so that students practice these skills in a professional way through the different stages of their lives. It is clear that many developed nations have created a suitable workplace that does not discriminate employees based on gender. This can be attributed to the fact that Jordanian society in general supports males and gives them freedom to move, mix, open up to others, and interact with the surrounding environment with its various components, with almost absolute freedom. While we found that there are many restrictions imposed on females that limit their ability to open up and interact more with the surrounding environment. There are several studies showing that the degree of practicing creative thinking among male students is higher than that among female students (Arab & Al-Ayed, 2012; Saadh et al., 1996).

*Third:* There is a significant difference of practicing creative thinking among the students of JUST due to academic year.

To demonstrate the result of this hypothesis, an analysis of one-way ANOVA was used (Table 5).

The results of the one-way ANOVA test revealed that there were no statistically significant difference in the level of practicing creative thinking among the students of JUST due to the variable of the academic year, as the statistical significance reached (0.426), which is greater than the function level (0.05). Therefore, we reject the positive hypothesis, which states that there are statistically significant differences in practicing creative thinking due to the variable of the academic year. This can be attributed to the fact there is almost constant teaching methods and curricula that the university provides to its students. There is a clear educational pattern that students walk through during the university studies, depending mainly on the classic cognitive aspect. Moreover, the surrounding environment does not support creative thinking, and can be described as a conformity environment dominated by traditional modes of thinking. In such environment, simple and normal thinking skills, such as knowledge,

Table 5. Results of one-way analysis of variance test to determine the difference practicing creative thinking among Jordan University of Science and Technology students due to academic year (source: created by authors)

	Sum of squares	df	Mean square	F	Sig.
Between groups	0.822	4	0.205	0.964	0.426
within groups	241.090	1131	0.213		
Total	241.912	1135			

understanding, and daily thinking are practiced, whereas metacognitive thinking is absent. This is supported by one important study (Safadi, 2015).

*Forth:* There is a significant correlation between practicing creative thinking among the students of JUST and academic achievement. To determine this, one-way ANOVA analysis has been applied (Table 6).

Table 6. Results of one-way analysis of variance test showing the effect of practicing creative thinking on academic achievement (source: created by authors)

	Sum of squares	df	Mean square	F	Sig.
Between groups	2.998	4	0.749	3.517	0.007
within groups	239.930	1126	0.213		
Total	242.928	1130			

The results of the test revealed that there are statistically significant differences in the degree of practicing creative thinking and academic achievement variable at a statistical significance level of 0.007 that is less than the level of 0.05.

The Scheffé method was performed to find out the relationship between the degree of practicing creative thinking and GPA ranges (Table 7). The results of the test showed statistically significant differences between the degree of practicing creative thinking and the GPA ranges 60–69 and 90–100, and at significance level of less than 0.05.

Table 7. Scheffé method to find the differences of academic achievement (source: created by authors)

(I)	(J)	Mean difference (I-J)	Std. error	Sig.	95% confidence interval	
					Lower bound	Upper bound
50–59	60–69	0.057	0.127	0.995	-0.33–	0.45
	70–79	-0.067–	0.122	0.990	-0.44–	0.31
	80–89	-0.086–	0.121	0.973	-0.46–	0.29
	90–100	-0.136–	0.123	0.874	-0.52–	0.24
60–69	50–59	-0.057–	0.127	0.995	-0.45–	0.33
	70–79	-0.124–	0.050	0.186	-0.28–	0.03
	80–89	-0.143–	0.049	0.074	-0.29–	0.01
	90–100	-0.193–*	0.053	0.010	-0.36–	-0.03–
70–79	50–59	0.067	0.122	0.990	-0.31–	0.44
	60–69	0.124	0.050	0.186	-0.03–	0.28
	80–89	-0.019–	0.033	0.987	-0.12–	0.08
	90–100	-0.070–	0.039	0.527	-0.19–	0.05
80–89	50–59	0.086	0.121	0.973	-0.29–	0.46
	60–69	0.143	0.049	0.074	-0.01–	0.29
	70–79	0.019	0.033	0.987	-0.08–	0.12
	90–100	-0.050–	0.038	0.783	-0.17–	0.07

*End of Table 7*

(I)	(J)	Mean difference (I–J)	Std. error	Sig.	95% confidence interval	
					Lower bound	Upper bound
90–100	50–59	0.136	0.123	<b>0.874</b>	–0.24–	0.52
	60–69	0.193*	0.053	<b>0.010</b>	0.03	0.36
	70–79	0.070	0.039	<b>0.527</b>	–0.05–	0.19
	80–89	0.050	.038	<b>0.783</b>	–0.07–	0.17

Note: \*The mean difference is significant at the 0.05 level.

This can be explained by the fact that creative thinking capabilities are somewhat influenced by academic achievement. Moreover, it does not mean that if the academic achievement was low that the person does not have the skills of creative thinking, as there are many aspects and experiences that contribute to the development of creative thinking skills, which were not taken into consideration in this study. The results of this comply with the results from other studies which revealed that there are different correlations between academic achievement and practicing creative thinking (Ai, 1999; Olatoye et al., 2010; Chauhan & Sharma, 2017).

### **Conclusions and recommendations**

It has been recognized that creativity thinking skills are one of the most important ones that young people must possess to be able to adapt, innovate and solve problems facing them, which should be reflected on the society progress and prosperity. The results of this study revealed that the level of practicing creative thinking among JUST students is moderate, which signifies to a gap between ambitions and reality. Male students are practicing creative thinking more than female students, which can attributed to socio-cultural and religious reasons. The results of the study showed that about 20% of the research sample with high academic achievement (GPA = 90–100) are practicing moderate creative thinking. Therefore, it is recommended that students’ creative thinking skills should be developed and enhanced through adopting effective policies and strategies that promote the culture of creativity, innovation, and leadership among university students. The essential infrastructure, such as incubators, and fabrication laboratories that help students transforming their creative ideas into reality, should be made available. Stimulating students’ creativity can be achieved by offering them financial support, and implementing activities and events that motivate students to practice creative thinking, such as hackathons, competitions and prizes. Pedagogical methods and curricula should be developed to cope with the technological advancements and contemporary issues and problems. Offering faculty staff specialized training programs in creative thinking, problem solving, and critical thinking is crucial. Embedding creative thinking skills into school curricula is very helpful. Emphasizing a culture of woman empowerment to enable her to take her rights in equality in all fields, such as leadership, work, education, *etc.*, to participate in the country development. Laying down of national policies that develop and improve the creative and innovative environment among Jordanian youth should be a national priority. Carrying out more studies focusing on thinking skills under other circumstances and societies is highly recommended.

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