

# Form a Visual Test of Torrance Tests of Creative Thinking: Criticism of Scoring and Test Execution in Iran

Bahare Delqandi<sup>1\*</sup>, Abolqasem Shakiba<sup>2</sup>

<sup>1</sup>Department of Counseling, Quchan Branch, Islamic Azad University, Quchan, Iran

<sup>2</sup>Farhangian University of Mashhad - Shahid Beheshti Campus

\*Corresponding Author Email: [xmas8893@gmail.com](mailto:xmas8893@gmail.com)

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**ABSTRACT:** The purpose of this study was to investigate the situation of Form A visual test of Torrance Tests (of Creative Thinking) scoring in Iran. For this purpose, Form A visual test of Torrance was conducted on 542 first to sixth grade elementary students of Jovein city. After the test, for each test picture, all students' responses were collected and then the frequency of each response and its percentage were obtained. According to Torrance's (1966) scoring method, based on the percentage of each response, the authenticity score was obtained for the different responses of each picture. Then the authenticity scores obtained for each picture were compared with the authenticity scores of the same picture from the Torrance scoring. The Chi square test was used for comparison of two types of scoring. The result showed that there is a significant difference between the Torrance scoring in the American society and the scoring of this test conducted in the Iranian society. As a result, for the Torrance test in Iran, the scoring should be in accordance with the conditions of the Iranian society.

**Keywords:** Creativity, Torrance Creativity Visual tests, Divergent Thinking, Authenticity.

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## INTRODUCTION

The Creator of being has created mankind so that he can become a caliph of Allah, and thus he has the ability to be able to achieve this high status. One of these amazing human abilities is creativity. In today's modern society, creativity has a special place in different fields and is considered to be the main factor for the development of countries. Educating creative people is one of the basic goals of modern education. In the past, creativity was considered as a mysterious factor, the monopoly of certain people that they could not be taught to others, while psychologists believe that creativity could be taught to everyone. Considering the importance of creativity, since the 1950s, a great scientific wave has been formed to identify and foster creativity, and a number of scientific theories have been developed in this regard (Soleimani, 2002). The famous theorists working in this field were Gilford and Torrance. Torrance (Seif, 2008) defines creativity as "the process of sensing problems, issues, information gaps, missing elements, unpleasant things, guessing and hypothesizing about these shortcomings and evaluating and testing these guesses and hypotheses, revising and re-examining them, and finally transferring results".

## **The importance of creativity evaluation**

Creativity can be an appropriate and complementary tool for assessing abilities and advancements. In addition to non – cognitive structures such as emotional intelligence and motivation, creativity can also be a good complement to such measurements (Kyllonen et al., 2005). The first option for such complement is creativity because: creativity is related to intelligence and schooling (institutional ability), but not so close (Kaufman et al., 2008). Another reason is that in many areas, and in particular, education people are interested in measuring creativity. In a research on faculty members of a university, researchers concluded that, according to professors, creativity is one of the most important competencies required to succeed in the university (Enright and Gitomar, 1989, quoted by Kaufman et al., 2008).

Regarding the importance of measuring creativity and putting it alongside other cognitive and non-cognitive structures, unfortunately, creativity is not measured in abilities and progress tests. Opponents of creativity tests often consider these tests to be in a low level of validity and credibility, and criticize the way they are scored. These criticisms are partly right about creativity tests, but given the dramatic growth of creativity tests in recent years and the more rigorous scoring used, they greatly improved the validity and reliability of the tests. Placing creative tests alongside traditional and standard tests, increases the quality of the test. Reich (2001) also argues: “Many new jobs depend on creativity, authenticity and innovation that standard tests do not measure them.”

In measuring creativity, many different tests have been developed so far. Creativity tests have been cohesively started since the time of Guilford (1968) and have been expanding day by day. The most famous test of creativity, which has so far been used extensively, is the Torrance Tests of Creative Thinking (TTCT). In this article, we are looking at whether the Torrance Creativity Visual tests Scoring, which is widely used in Iran and extensive research is valid? Is the Torrance tests scoring still valid in the 21<sup>st</sup> Century? Can the Torrance test scoring be used in Iran? In this article, first, the Torrance Tests of Creative Thinking is briefly described and then we answer the above questions.

## **Torrance Tests of Creative Thinking**

Torrance is renowned for its famous creativity tests, but creativity testing was not one of Torrance's objectives for tests, but rather these tests are tools for researching and recognizing the status of students to fit the curriculum with their potential (Kim, 2007). Several tests for creativity are among the valuable contributions of Torrance to the field of creativity. The Torrance Tests of Creative Thinking (TTCT) was first launched in 1966. In Torrance Tests of Creative Thinking, creativity is assessed with a number of visual and verbal questions. These tests are a tool for research and recognition of students' abilities. Torrance tests are based on the idea that creativity can be measured and then cultivated through various exercises. Torrance's research on creativity arose the issue that intelligence tests (IQs) can only measure intelligence and cannot measure the capabilities that make creativity in people (Powell, 2003 & Shearer, 2003). Torrance (1966) believed that creative thinking needs a kind of divergent thinking. Of course, Guilford (1968, Seif, 2008) was the first to raise the issue of divergent thinking in creativity psychology, and then Torrance expanded it and proceeded to measure divergent thinking. Divergent thinking and convergent thinking are two main aspects of human thinking. The difference is that in the convergent thinking the result of the thought is already known, that is, there is always a right or wrong answer, but in divergent thinking there is no definite answer and there are many possible answers that can be logically correct (Seif, 2008). Thus, in the Guilford and Torrance theories, creativity has been defined in terms of divergent thinking, and Torrance created the Tests of Creative Thinking (TTCT) to measure divergent thinking.

The Torrance Tests of Creative Thinking has a long history and dates back to 1966. In 1966, Torrance published the TTCT. This test is one of the most common divergent thinking tests and is used in different countries. In a review published in Creativity research, Torrance and Presbury (1984) found that TTCT was used in most of the research on creativity. Callahan et al (1995) also pointed out in their studies that Torrance tests are among the most commonly used tests to identify the potential of creativity in elite training programs.

Torrance tests have been used extensively and continuously in educational environments and are part of the broadest divergent thinking tests. In the decades, the scoring and implementation of TTCT has been edited and is one of the most popular tests. The Torrance Tests of Creative Thinking includes verbal and visual tests, each of which has two parallel forms A and B, which can be used alternatively. The visual form of this test includes the following subtests:

**Making the picture:** The subject is asked to stick an egg - like shape (form A) or a bean-like shape (form B) on a white sheet and make a picture with this shape during 10 minutes. This shape must be an integral part of the final picture.

Unfinished shapes: In this subtest, ten unfinished shapes are given and the subject is asked to complete each of the unfinished shapes within ten minutes.

Parallel lines/circles: A large number of parallel lines (form A) or circles (form B) are given to the subjects and they are asked to make shapes as possible as they can with these lines and circles, within ten minutes.

The TTCT, in its original version (1966), measured four sub-scales, including:

- 1-Fluidity: Includes the number of related ideas. Indicates the ability to generate number of pictures.
2. Authenticity: Is the number of statistically rare ideas. Torrance has provided a list of items for each item, and then, regarding the list, the items to which people paid less attention, get higher the authenticity.
3. Expansion: Counting the number of ideas added to the original picture. For each additional idea given to the base answer, a score is awarded.
4. Flexibility: Ability to generate ideas in different categories. Torrance has put people's different responses in different categories. Considering the number of categories given in the responses, the flexibility score obtains.

These four sub-scales are obtained in each of the three subtests, and then, by aggregating the scores in the subtests, four scores are obtained for each person. Torrance's emphasized on the interpretation of the test based on these four subs - scales and believed that we should avoid using the whole score for the creativity of the subject.

### **The Torrance Tests of Creative Thinking (TTCT) in Iran**

Long time after the TTCT flourished, and with great progress, Karami and Mohammadi (1999) translated forms A and B of Torrance creativity and brought it into Iran. Karami and Mohammadi (1999) translated the original version along with scoring and its implementation method into Persian and provided it to researchers in the area of creativity and education. The indices that are measured in the Persian version of Torrance creativity test include: fluidity, authenticity, flexibility, and expansion. These indices were edited after 1966, and Torrance, after 1966, used a more sophisticated scoring system, eliminating many criticisms of his mental scoring system, but in Iran since 1999, the same version has been used and no changes have been made.

## **MATERIALS AND METHODS**

The research method in this study is descriptive and merely collects students' responses to the form a visual test of Torrance creativity. The research population includes all elementary students of Sabzevar city. Cluster sampling was used for a sample of thirty classes which were selected randomly. In total, the classes were 585 students from the first to the sixth grade. From the coordination with the education management and in collaboration with the class teachers, a Form A visual test of Torrance creativity was implemented. Before execution of the test, a session was held for 30 teachers of selected classes and test and its implementation method was discussed.

The test used in the study was a Form A visual test of Torrance Creativity, translated into Persian by Karami and Mohammadi (1999). The original version of the test has been translated into to Persian without any changes, and measures four scales of fluidity, authenticity, flexibility and expansion. After performing the test, all answers given to each picture were collected. Then, the frequency and percentage of each response was obtained. In accordance with the principle of authenticity scoring, which was carried out by Torrance (1999), the method was also used in this study. The method was that in each subtest, the authenticity scoring was different. Each sub-test was explained in scoring order.

Picture construction subtest: In the picture construction subtest, authenticity scores were taken on a scale from 0 to 5. Answers that occurred in 5 or more than 5 percent, did not receive any authenticity scores. Answers occurred in 4% to 4.99% of the cases, receive authenticity score of one. The answers that occurred in 3 to 3.99% of the cases receive authenticity score of 2. The responses that occurred in 2 to 2.99% of cases, received authenticity scores of 3. Those that occurred in 1 to 1.99% of the cases are awarded with authenticity score of four. All responses that occurred under one percent received a score of 5.

Picture Completion subtest: In the picture completion subtest, the range of authenticity scores is from zero to two, so that responses that occurred in 5 or more than 5% of the cases received authenticity score equal to zero. Cases occurred in 2 to 4/99 percent; received authenticity score of 1 and all responses below 2 percent receive a score of 2.

Parallel Lines subtest: In the parallel lines subtest, the range of authenticity scores is from zero to three. For the answers that are reported in 20 or more of the 20% cases, the score for the authenticity is zero. The answers given in 5 to 19.19 percent of cases, authenticity score is 1. Responses that occurred in 2 to 4.99 percent of the cases receive an authenticity score of 2, and all answers below 2 percent, received authenticity score of 3.

According to the mentioned conditions, the percentage of each response was obtained and the authenticity score was determined. Then, in the next stage, the authenticity score of each response was compared with authenticity score of the same answer in Torrance's score. Then, in each picture, the number of responses that were similar and different in two scoring methods (e.g. scoring of this research and Torrance scoring) were obtained. Then, with the Chi square test, two significance levels with two scoring methods were determined, which are presented in the results section.

**RESULTS**

After implementation of the test on 585 students, we examined test sheets and excluded some sheets that did not have scoring conditions or some of the students responded incompletely. 542 tests were finalized. For each test picture, all student responses were collected. Then, the frequency of each response and its percentage were obtained. In total, for each picture we provided the scoring table. According to the definition of authenticity, for the answers that are more frequent, the authenticity is lower, and the lower frequency of the answer, the higher the authenticity score. Because of the high number of tables, only one score table is examined from each subtest. First, the frequency and percentage of responses given to the first subtest, i.e. picture construction, are shown in Table 1.

**Table 1.** Frequency and percentage of students' responses to picture construction subtest.

Response	Frequency	Percentage	Authenticity Score	Response	Frequency	Percentage	Authenticity Score
Butterfly	33	6.02	0	Tree	8	1.45	4
Egg	47	7.6	0	Sheep	6	1.09	4
Colored egg	41	7.48	0	Ladybird	10	1.82	4
Human body	52	9.48	0	Drop	6	1.01	4
Chick	28	5.10	0	Cat	6	1.09	4
Chicken and duck	29	5.29	0	Snowman	8	1.45	4
Egg with arms and legs	23	4.19	1	Penguin	9	1.64	4
Mouse	23	4.19	1	Dragonfly	1	0.01	5
Rabbit	18	3.28	2	Stone	3	0.54	5
Human face	18	3.28	2	Melon	1	0.01	5
Bear	19	3.46	2	Dates	1	0.01	5
Balloon	14	2.55	3	Sun	3	0.54	5
Fish	15	2.73	3	Dinosaur	1	0.01	5
Bee	13	2.55	3	Koala nose	1	0.01	5
Flower	14	2.55	3	Giraffe	1	0.01	5
Turtle	11	2.007	3	Cow's head	1	0.01	5

As shown in Table 1, responses that are more frequent and more than 5% of the subjects have given these responses, their authenticity is zero, including: butterfly, egg, colored egg, human, chick, chicken and rooster. But for comparison, the Torrance scoring table (1999) for the picture construction subtest is shown in Table 2.

**Table 2.** Authenticity scoring by Torrance of picture construction (adapted from Torrance, 1999).

Response	Authenticity score	Response	Authenticity score
Human being (all types)	0	Flower	4
Egg	0	Human ear	4
Egg (new year's)	0	Animal ear	5
Egg (in a basket)	0	Hat	5
Circle	0	Balloon	4
Abstract design without meaningful title	0	Eye	4
Drop (tear)	0	Chick	4
Girl (woman, female)	1	Insect	4
Face (human)	2	Rabbit	4
Aliens	3	Sun	4
Nose	3	Cat	4
Birds	3	Balloon	4
Space ship	3	Eye	4

To investigate the hypothesis that there is a significant difference between the Torrance scoring and the scoring of this research, all of the responses that were given in both Torrance scoring and in the scoring of this research by 1% of the subjects, were collected. Then, the frequency of similar responses in terms of scoring and also the frequency of different responses in terms of scoring were obtained. Then, we tested them with significance test of chi-square, which is shown in Table 3.

**Table 3.** Frequency and analysis of chi - square in picture construction subtest.

	Frequency	df	Chi square	Sig.
Similar responses	10	1	9.256	0.002
Different responses	29			

As shown in Table 3, the chi - square obtained is 9.25, which is rejected according to distribution of two null hypotheses at 0.01 significance level and the research hypothesis is accepted. That is, there is a significant difference between the Torrance scoring and the scoring of this research in the subtest of picture construction. For example, a chick will receive four authenticity scores in Torrance scoring, while among Iranian students, the frequency of this response is high and zero is awarded to authenticity.

But in picture completion subtest, there are ten unfinished pictures and for each picture, student's responses were extracted, and the frequency and percentage of them were obtained. To summarize, the table of responses to picture 1, is shown in Table 4.

**Table 4.** Frequency and percentage of students' responses to picture 1 of picture completion sub-test.

Name	Frequency	Percentage	Authenticity score
Cloud	70	13.97	0
Eyebrow	87	17.36	0
Eye	39	7.78	0
Mustache	29	5.78	0
Human face	40	7.98	0
Glasses	74	14.77	0
Heart	68	13.57	0
Apple	14	2.79	1
Flower	11	2.19	1
Lip	13	2.59	1

As shown in Table 4, according to the Torrance Scoring method (1966), responses that are replicated from 5% or more than 5% of the subjects, their score of authenticity is zero. Answers of 2 to 5% receive the authenticity score of

1. And the responses which are below two percent, their authenticity score is 2. To compare the responses of Iranian and American students in picture 1 of picture completion subtest, the Torrance scoring table is also presented from picture 1 of picture completion subtest in Table 4.

**Table 5.** Torrance Scoring of authenticity in picture 1 of picture completion subtest (adapted from Torrance, 1999).

Response	Authenticity score	Response	Authenticity score
Abstract design without a meaningful title	0	Cloud	1
Bird	0	Eyebrow	1
Face or head	0	Glasses	1
Heart	0	Girl or woman	1
Human	0	Lip and teeth	1
Apple	1	Giant	1

To investigate the hypothesis that there is a significant difference between the Torrance scoring and the scoring of this research, all of the responses that were given in both Torrance scoring and in the scoring of this research by 2% of the subjects, were collected. Then, the frequency of similar responses in terms of scoring and also the frequency of different responses in terms of scoring were obtained. Then, we tested them with significance test of chi-square, which is shown in Table 6.

**Table 6.** Frequency and analysis of chi - square in picture 1 of picture completion subtest.

	Frequency	df	Chi square	Sig.
Similar responses	5			
Different responses	14	1	4.263	0.039

As shown in Table 6, the obtained result of chi – square is 4/26 which, according to chi distribution, two zero hypotheses are rejected at 0.05 significance level and the research hypothesis is accepted. That is, there is a significant difference between the Torrance scoring and the scoring of this research in subtests for picture completion. For example, in Torrance scoring, the eyebrows and glasses answers are given authenticity score of 1, while Iranian students used more eyebrows and glasses more responses, resulting in an authenticity score of zero.

However, in the subtest of parallel lines, the responses of all students were gathered, and then the frequency and percentage of each response were obtained. Because of the vast responses of students in this section, only the most frequent answers have been shown in Table 7.

**Table 7.** Frequency and percentage of students' responses to parallel line subtests.

Response	Frequency	Percentage	Authenticity Score	Response	Frequency	Percentage	Authenticity Score
Human	199	38.12	0	Ladder	130	24.90	0
Butterfly	176	33.71	0	Road (street)	35	6.70	1
Window	145	27.77	0	Pencil case	97	18.58	1
House	315	60.34	0	Traffic light	33	6.33	1
Tree	361	69.15	0	English letters (M, W, B, N, H and etc.)	34	6.51	1
Door	223	42.72	0	Hand	30	5.74	1
Book (Qoran or notebook and etc.)	160	30.65	0	Drawers	33	6.32	1
Closet	111	21.26	0	Notebook (open or an open book)	32	6.13	1
Flower	135	25.86	0	Clock	86	16.47	1
Vase	116	22.22	0	Trash bin	40	7.66	1
Glass	170	32.56	0	Pants	47	9.00	1
Pencil	165	31.60	0	Chair	34	6.51	1

As table 7 shows, according to Torrance scoring method (1966), for the answers that are reported in 20 or more of the 20% cases, the score for the authenticity is zero. The answers given in 5 to 19.19 percent of cases, authenticity score is 1. Responses that occurred in 2 to 4.99 percent of the cases receive an authenticity score of 2, and all answers below 2 percent, received authenticity score of 3. But, in order to compare responses of Iranian and American students, a number of responses which Torrance has determined for parallel lines are shown in table 8. Torrance has considered authenticity score of zero for responses with higher frequency.

**Table 8.** Torrance scoring of parallel lines subtest (adapted from Torrance, 1999).

Response	Authenticity score	Response	Authenticity score
Human	0	Racket	1
Face	0	Gift	1
Window	0	Pencil	1
Picture frame	0	Desk	1
Geometrical design	0	Flower	1
Alphabet letters	0	Hat	1
House	0	Road	1
Door	0	Paper	1
Tree	0	Boat	1
Book	0	Pants	1
Ladder	0	Chair	1
Swing	1	Butterfly	2
Can	1	Closet	2

To investigate the hypothesis that there is a significant difference between the Torrance scoring and the scoring of this research in parallel lines subtest, all of the responses that were given in both Torrance scoring and in the scoring of this research by 1% of the subjects, were collected. Then, the frequency of similar responses in terms of scoring and also the frequency of different responses in terms of scoring were obtained. Then, we tested them with significance test of chi-square, which is shown in Table 9.

**Table 9.** Frequency and Chi-square Analysis in Parallel Line subtest.

	Frequency	df	Chi square	Sig.
Similar responses	9	1	8.257	0.004
Different responses	26			

As shown in Table 9, the obtained result for chi – square is 8.2 which according to chi - square distribution, the two zero hypotheses are rejected at the 0/01 significance level and the research hypothesis is accepted. That is, there is a significant difference between the Torrance scoring and the scoring of this research in the parallel lines subtest. For example, responses such as butterfly, closet, and flower have high frequency among students in this study, but these responses are less frequent in the Torrance scoring table and have a higher authenticity score.

**Discussion**

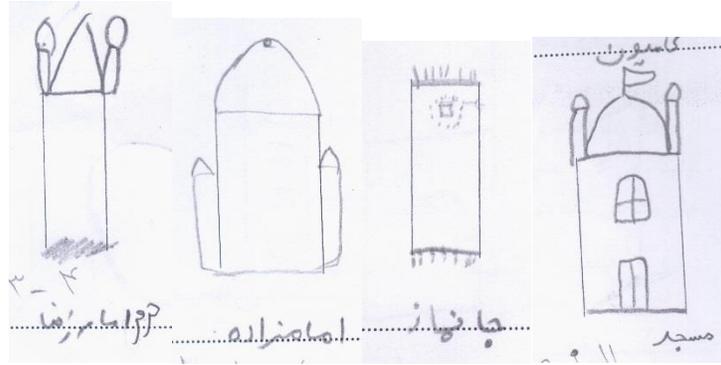
As the comparison of the Torrance scoring tables based on American subjects and the scoring taken in this study, it became clear that there is a major difference in these two types of scoring. A very important and meaningful issue in the implementation of the Torrance creativity test is to take into account the culture of each society and social change. Torrance (1966, quoted in Kim, 2006) argues that TTCT should be updated with respect to culture and education and social change. Different cultures should create different norms for themselves. According to Torrance’s description, the Persian version of Torrance creativity test, which has been conducted in Iran since 1999, ignores at least two important factors. 1) Cultural and religious changes, and 2) The factor of social changes that occur over time.

1. Cultural and Religious Changes: Torrance (1966) conducted his test on 500 subjects. Subsequently, given the responses for each picture, the classification was made for scoring, in particular, authenticity and flexibility. The conditions that Torrance considered for responses, the responses in the subtest for picture completion for each component less than 2% of the subjects gave, were considered, received an authenticity score of 2, and the answers that were between two and five percent, their score authenticity score was 1, and responses higher than 5 percent had authenticity score of zero (Torrance, 1966 translation of Karami and Mohammadi, 1999). However, according to the circumstances of American participants and their cultural and religious differences with Iranian participants, then the difference between the responses of American and Iranian participants will be very significant.

The responses of Iranian students are derived from Iranian and Islamic culture and religion. Responses such as Mosque, Imam Zadeh, Mehrab, Chadori girl and etc. are very frequent in Iranian students’ responses, while these answers are not mentioned in the Torrance score list. Some examples of Iranian students’ responses are listed in Table 7. In Figure 1, an example of these responses related to the culture of Iranian students is presented.

**Table 10.** Some responses of Iranian students in parallel lines sections that indicate cultural and religious changes.

Response	Frequency	Percentage	Authenticity score
Mosque	35	6.70	1
Imam	2	0.38	3
Prayer carpet	8	1.53	3
Holly shrine	2	0.38	3
Chadori girl (woman)	11	2.10	2
Bookrack of Qoran	1	0.19	3



**Figure 1.** Some students’ responses that show cultural and religious changes.

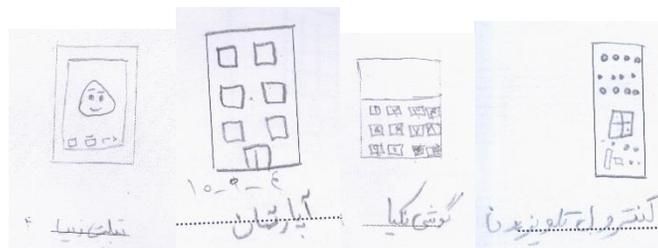
As shown in Table 10, 35 Iranian students of this study in their responses drew the picture of Imam Zadeh or the mosque, which according to the scoring criteria take the authenticity score of 1, while according to the Torrance score list, they should receive the authenticity score of 3. Then, the cultural and religious factor is one of the most important and influential factors in the scoring the Torrance Creativity Test. This test must be revised in various cultures in order to adapt to the conditions of that culture.

2. Social changes that occur over time. According to Torrance (1966), the test scoring should be updated over time. Since 1966, when the initial version of the test was published, it has been over fifty years and during this time, students’ responses have changed considerably. Thus, the Form A visual test of Torrance was performed on 500 elementary school students in Jovein City in 2016. Some of the responses given by subjects to pictures do not exist in the Torrance scoring including Mobile, Tablet, TV, Sponge Bob and etc. Table 11 shows a number of students’ responses along with percentages.

**Table 11.** Some responses of Iranian students in parallel lines sections that indicate social changes over time.

Response	Frequency	Percentage	Authenticity score
Mobile phone (tablet)	45	8.62	1
Telephone device	20	3.83	2
Remote control (TV and etc.)	11	2.10	2
Radiator	12	2.29	2
TV (Monitor)	57	10.91	1
Sponge Bob	18	3.44	2

As shown in Table 11, 45 Iranian students of this study in their responses drew a mobile or a tablet device picture which, according to the scoring conditions, take the authenticity score of 1, while according to the Torrance score list, they should receive the authenticity score of 3. Then, the social change over time factor is one of the most important and influential factors in the scoring the Torrance creativity test that this test should be revised at different times in its scoring system in order to adapt to the circumstances of that period. In Figure 2, some of the students’ responses which show time variations and their impact on students’ responses are presented.



**Figure 2.** Some student responses that show the impact of social change over time.

According to the present study, it is suggested that the Torrance creativity tests in Iran be implemented and the scoring of these tests are corrected in accordance with the cultural conditions of Iran. In addition, it is suggested that Torrance creativity tests be implemented among students of different educational levels and adults and then the Iranian norms of these tests should be determined.

#### **Conflict of Interest**

The authors declare no conflict of interest.

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