Which Divergent Thinking Index is More Associated with Problem Construction Ability? The Role of Flexibility and Task Nature

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Draft version: October 1st, 2020. This paper is under review

Abstract

Problem construction and divergent thinking (DT) are considered to be indicators of creative potential. Previous studies, with different goals, suggest a positive correlation between problem construction and DT. However, none of these works have explicitly examined which index of DT is more associated with problem construction. The current investigation examined the association between problem construction and three main indexes of DT: fluency, flexibility, and originality. It also tested whether such a relation differs based on task nature (verbal versus figural). The sample consisted of 90 sixth graders who completed three tests: (a) a verbal DT test, (b) a figural DT test, and (c) a problem construction test. Correlational analysis showed that flexibility was highly correlated with problem construction in the verbal DT test, whereas originality was highly correlated with problem construction in the figural test. The association between problem construction and verbal versus figural DT significantly differed in all DT indexes. This finding suggests that figural and verbal tasks assess DT in a different way, which was confirmed by a canonical correlation analysis. Finally, results of a multiple regression analysis showed that verbal DT significantly explained 59% of the variance in fluency scores in problem construction and 60% in originality scores in problem construction. Meanwhile, figural DT explained 8% to 9% of the variability in fluency and originality scores in problem construction. As suggested by experts in the field of problem construction, the role of flexibility in problem construction is a fertile area to be considered in future studies.

Keywords: problem construction, divergent thinking, task nature, ill-defined problems

1. Introduction

The significance of problem construction is widely recognized, and it is considered to be the first step in any creative problem-solving effort (e.g., Mumford et al., 1991; Osborn, 1953; Treffinger & Isaksen, 2005; Wallas, 1926). Some scholars have considered problem construction to be more important than problem solving (e.g., Csikszentmihalyi, 1988; Einstein & Infeld, 1938; Mackworth, 1965; Wertheimer, 1945). A recent meta-analysis showed that problem construction and creativity are significantly positively correlated (Abdulla et al., 2020), and the effect size is the nearly same as that reported in a meta-analysis (Kim, 2008) on the correlation between divergent thinking (DT) and creative achievement.

The history of studying problem construction started with the seminal work of Csikszentmihalyi and Getzels (1971) that aimed to assess problem construction in art students. Since then, the field of creativity research has shown a growing interest in studying problem construction. However, this important cognitive process has not receiving as much attention from researchers in the creativity field relative to DT or ideation. To date, there is only one edited book on problem construction (Runco, 1994a). Figures 1 and 2 show a comparison between the number of hits when three terms (problem solving, DT, and problem construction) were searched from 1960 to 2020 in the following databases: ERIC, Academic Search Complete, Academic Search Premium, and ProQuest Central. Advanced searched was used, and the following combinations of keywords were used: (a) problem solving AND creativity OR creative, (b) DT AND creativity OR creative, and (c) all terminologies of problem construction reported in Abdulla and Cramond (2018; see page 202) AND creativity OR creative. The search included titles only, and redundant works were eliminated.

Figures 1 and 2 around here

While the results indicate that there is indeed growth for research on problem construction, and it is increasing at a higher rate relative to other research, the sheer number of papers is still relatively small. This is problem for a number of reasons. First, problem construction is an essential element in all models of creative process. Wallas (1926), Osborn (1953), and Merrifield et al. (1962) called such a step *preparation*, whereas others used different terminologies, such as problem finding (PF), problem identification, and idea finding (Amabile, 1988; Mumford et al., 1991; Reiter-Palmon et al., 1997; Runco, 1994a; Silverman, 1985). Regardless of the terms used, they all refer to a situation in which the problem is ill-defined. In addition, some definitions of creativity explicitly include problem construction (e.g., Cropley, 2011; Runco, 2014; Torrance, 1966). Second, advancing innovation and creativity for the benefit of business and society is depends on those who can sense gaps in knowledge and discover ill-defined problems to solve them in a novel way. A meta-analysis by Ma (2009) indicated that problem construction was the strongest predictor of creativity providing support for this assertion.

However, this is not to say that other cognitive processes are less important than problem construction for creativity and creative thinking. The argument here is that problem construction is an essential cognitive ability that deserves more attention from researchers in the creativity field.

Nonetheless, after six decades of systematic study of problem construction, we have a better understanding of the relation between problem construction and some cognitive processes,

such as inter and intrapersonal evaluation (Basadur, 1995; Mumford et al., 1991; Runco, 1994b), problem solving (Arlin, 1975; Bouchard & Drauden, 1976; Carson & Runco, 1999), selective encoding and combination, selective comparison (Brugman, 1995), and DT (e.g., Arlin, 1975; Artley et al., 1980; Chand & Runco, 1993; Csikszentmihalyi & Getzels, 1971; Hoover, 1994; Wakefield, 1985).

Among these cognitive processes, creativity literature suggests DT to be associated with problem construction. Many researchers have sought to explore such an association (Ambrosio, 1993; Arlin, 1975; Chand & Runco, 1993; Hoover, 1994; Hoover & Feldhusen, 1990; Reiter-Palmon et al., 1997; Runco & Acar, 2010; Wakefield, 1985); however, these studies have yielded conflicting findings (see Table 1). Such conflict might be due to (a) the DT and problem construction assessments used in the studies, (b) the DT skills targeted (i.e., fluency, flexibility, and originality), and (c) the task nature (verbal vs. figural tasks).

Table 1 around here

For example, Ambrosio (1993) used the figural form of the Torrance Test of Creative Thinking (TTCT) and reported a negative relation between DT and problem construction quality ($r = -.08$), and a significant positive relation between DT and problem construction quantity ($r = .41$). Arlin (1975) reported a positive relation between problem construction quality and adaptive flexibility ($r = .26$), and a negative relation between problem construction quality and spontaneous flexibility ($r = -.09$) and fluency ($r = -.18$). Runco and Acar (2010) showed a significant positive relation between verbal DT test and problem construction (r ranged from .29 to .44).

As shown in Table 1, only one study looked at the relation between problem construction and elaboration (i.e., Arlin, 1975), and only two studies examined the relation between problem construction and flexibility (Arlin, 1975; Hoover, 1994). It has been suggested that the specific DT measure and index used (verbal or figural; fluency, originality or flexibility) can affect the results (Hornberg & Reiter-Palmon, 2017; Reiter-Palmon et al., 2019). Further, much of the research utilizing DT tasks tends to use fluency. Therefore, one of the contributions of this study is to evaluate flexibility and originality in addition to fluency. Flexibility in particular may be critical for problem construction. According to Mumford et al. (1994), “Flexibility in applying selection and screening strategies may contribute to individual differences in problem finding skills.” In addition to evaluating the relationships with different indices of DT, our study also determined whether the relationship between DT and problem construction will differ based on the nature of the DT task, verbal or figural.

2. Methods

2.1. Participants and Procedures

The participants included 90 students in the sixth grade (42 boys and 48 girls). We randomly collected data from two public schools after receiving the official approval from the Directorate for Scientific Research at the Ministry of Education. Prior to data collection, each participant was asked to read and sign a consent form prepared by the authors of this study.

Before the tests were administered, the first author visited the two schools and spent one class (40 minutes) with the students to create familiarity with them (no DT or problem construction activities were discussed). By the end of this meeting, the author informed the study participants of a subsequent visit in the next week to administer some activities that could show the students’ creativity. The test was administered in the second class/session (8:45 am), as

recommended by the teachers. The participants were informed that they will obtain the results of their “creative activity score” after the authors had scored them. The tests were conducted in a game-like condition (untimed), following the results of a recent meta-analysis that showed that the untimed condition significantly improves students’ performance in DT tests (Said-Metwaly et al., 2020).

2.2. Instruments

2.2.1. Uses Test

We administered three tasks from the Uses test (Wallach & Kogan, 1965): (a) uses for a spoon, (b) uses for a wheel, and (c) uses for a toothbrush. The directions for the task are as follows:

In this game, I am going to name an object—any kind of object, like a light bulb or the floor—and it will be your job to tell lots of different ways that the object could be used. Any object can be used in a lot of different ways. Remember, think of all the different ways you could use the object that I mentioned (Wallach & Kogan, 1965, p. 31).

Responses to the Uses test were scored for fluency, flexibility, and originality. A total of 199 *different* ideas were generated for the spoon task, 124 different ideas for the wheel task, and 181 different ideas for the toothbrush task. Fluency was defined as the number of different ideas related to a given stimulus. Flexibility was defined as the number of different categories or shifts between ideas. Based on participants’ responses, 12 categories were created for the spoon task, 11 for the wheel task, and eight for the toothbrush task (see Table 2). Finally, originality was scored based on a 3% cutoff criterion.

2.2.2. Figural Test

We administered the Figural test from the Runco Creativity Assessment Battery, which consists of three tasks, similar to the Wallach and Kogan Line Meaning test (Wallach & Kogan, 1965, p. 36). The Figural test includes three shapes: Spiral, Blocks, and Lines. The directions are as follows:

Look at the figure below. What do you see? List as many things as you can that this figure might be or represent. This is NOT a test. Think of this as a game and have fun with it! The more ideas you list, the better (Runco et al., 2016, p. 6).

The Figural test was also scored for fluency, flexibility, and originality. A total of 105 different ideas were generated for the first task (Spiral), 111 for the second task (Blocks), and 53 for the third task (Lines). For flexibility, 10 categories were created in the Spiral task, 11 categories in the Blocks task, and 11 categories in the Lines task. Originality was scored using the same method as the Uses test (i.e., 3% cutoff).

Table 2 around here

2.2.3. Problem Generation Test

We used the Problem Generation (PG) test to assess participants' problem construction ability (Okuda et al., 1991; www.creativitytestingservices.com). The PG test consists of three open-ended tasks that require participants to list as many problems as they can. This kind of assessment can be considered as a *problem discovery* test given that participants are asked to generate as many problems as they can (real or hypothetical) without any instruction to evaluate any of their ideas, or that their ideas will be evaluated. The three PG tasks are related to (a) home

and school, (b) life situations, and (c) health and well-being. An example of a PG task is as follows:

List problems along with your friends, peers, or schoolmates (any individual who is approximately the same age as yourself). These problems can be real, or they can be hypothetical and imaginary. Do not limit yourself; the more problems you can list, the better. You can think of problems that exist now or those that might exist in future.

The PG test was scored for fluency and originality. The reason for not scoring for flexibility was that the nature of the tasks was extremely diverse. PG tasks asked participants to list real and hypothetical problems, which made it difficult to score for flexibility. The participants generated 235, 253, and 269 different ideas in the first, second, and third tasks, respectively. The same method was utilized for scoring fluency and originality in the PG test.

Finally, the students were asked to fill out a demographic questionnaire with items on their age and sex.

3. Results

3.1. Reliability

Both inter-class correlation (ICC) and internal consistency reliability were calculated for the three tests used. As mentioned above, DT verbal and figural tests were scored for fluency, flexibility, and originality, whereas problem construction was scored for fluency and originality. Table (3) shows the reliability coefficients for the three tests. For the ICC, a two-way mixed model absolute agreement was calculated.

Table 3 around here

As moderate reliability coefficients were observed in the Figural test, we looked at each task of the Figural test. The Lines task showed lowered reliability coefficients in the Figural test. After removing the Lines test, the reliability coefficients in the Figural test improved. Therefore, the Lines task scores were eliminated in all subsequent analyses.

3.2. Correlation Analysis

As shown in Table 4, the pattern of correlations between DT and problem construction differed in the verbal versus figural tests. In the verbal DT, the highest correlation was found between flexibility and (a) problem construction fluency ($r = .75, p < .001$) and (b) problem construction originality ($r = .74, p < .001$), followed by the correlation between (c) verbal fluency and problem construction fluency and originality ($r = .73, p < .001$). Originality in DT was also significantly correlated with (a) fluency in problem construction ($r = .67, p < .001$) and (b) originality in problem construction ($r = .68, p < .001$).

Meanwhile, the magnitude of the correlation between figural DT and problem construction was much lower compared with verbal DT, which ranged from .22 to .30. We tested whether the relation between problem construction and DT was statistically different based on the task nature (i.e., problem construction and verbal DT *vs.* problem construction and figural DT; Lee & Preacher, 2013; Steiger, 1980, pp. 237–248). In transforming the Pearson correlation coefficients to Fisher's z , the results showed that the relation between fluency in problem construction *and* DT (verbal *vs.* figural) was significantly different in terms of fluency ($z = 4.48, p < .001$), flexibility ($z = 4.47, p < .001$), and originality ($z = 3.31, p < .001$); and originality in

problem construction *and* DT (verbal vs. figural) was significantly different in terms of fluency ($z = 4.26, p < .001$), flexibility ($z = 4.18, p < .001$), and originality ($z = 3.28, p < .001$). Thus, it can be concluded that the task nature significantly influenced the relationship between problem construction and DT such that verbal tasks were more strongly related to problem construction.

A canonical correlation analysis (CCA) was conducted to examine the relation between the verbal and figural DT tests. The results showed no significant correlation between the verbal and figural DT in all DT indexes: (a) fluency [Wilks' Lambda = .850, $R_c = .35, p = .13$], (b) flexibility [Wilks' Lambda = .970, $R_c = .17, p = .60$], and originality [Wilks' Lambda = .998, $R_c = .04, p = .70$].

Table 4 around here

3.3. Regression Analysis

Multiple regression analysis was conducted to evaluate the prediction of the dependent variables (i.e., figural and verbal DT) on problem construction scores (see Table 5). Verbal DT indices were significantly related to problem construction fluency [$F(3,86) = 41.94, p < .001, R^2 = .59$] and problem construction originality [$F(3,86) = 42.21, p < .001, R^2 = .60$]. Meanwhile, figural DT was not statistically related to problem construction fluency [$F(3,86) = 2.34, p = .079, R^2 = .08$] but significantly related to problem construction originality [$F(3,86) = 2.78, p = .046, R^2 = .09$].

Table 5 around here

3.4. CCA

We performed a CCA for each DT index and problem construction. The first set included fluency in the Uses *and* Figural tests, and the second set included fluency *and* originality in problem construction. The results showed that fluency in the Uses test significantly correlated with problem construction fluency and originality [$Rc = .74, p < .001$], whereas fluency in the Figural test was not significantly correlated with problem construction fluency and originality [$Rc = .16, p = .13$].

In the second CCA, flexibility in the Uses and Figural tests was entered as set 1. The results showed that flexibility in the Uses test significantly correlated with problem construction fluency and originality [$Rc = .75, p < .001$], whereas flexibility in the Figural test did not significantly correlate with problem construction fluency and originality [$Rc = .14, p = .20$].

Finally, in the third CCA, originality scores in the Uses and Figural tests were entered as set 1. The results indicated a significant correlation between originality in the Uses test and problem construction [$Rc = .69, p < .001$]. We found a non-significant relation between originality scores in the Figural test and between problem construction fluency and originality [$Rc = .12, p = .25$].

4. Discussion

Studies on problem construction have suggested that some cognitive processing skills are related to problem construction, and have also paid attention to DT along with problem construction. Previous research has examined the association between problem construction and DT, however, none of these studies have explicitly aimed to examine multiple DT indices and tasks and the relative association with problem construction. The results of our study showed that flexibility, which was neglected in previous works on problem construction and DT, was highly

correlated with problem construction compared with fluency and originality, especially when verbal tasks were administered. Arlin (1975) described problem finders as “flexible thinkers.” Our findings support this claim and suggest that good problem finders are characterized by an ability to shift between ideas and keep formulating different ideas to find a novel problem that needs to be solved. However, more studies are needed to elucidate fully the role of flexibility in problem construction.

The other important finding in the present study is the difference in the relation between problem construction and DT based on the task nature. We found that problem construction can be better assessed using verbal tasks than figural ones. This finding is partly supported by Abdulla et al. (2020), in which problem construction in the writing domains is highly correlated with creativity ($r = .36$) compared with art ($r = .20$). One issue that future studies might consider is whether highly capable problem finders are overrepresented in writing versus in other domains. It is possible that the strong correlations between problem construction and DT in the writing domain is in part a result of both requiring writing as the mode of generated responses. Previous research suggests that the task and index of measurement is important in understanding these types of relationships (Reiter-Palmon et al., 2019; Reiter-Palmon & Schoenbeck, in press). Additional research evaluating whether these relationships hold with other verbal DT measures such as consequences as well as other figural DT measures would help clarify this issue.

It is also important to note problem construction is not a single process. Many scholars have differentiated known problem construction skills, such as problem definition, problem identification, and problem discovery (e.g., Getzels, 1982; Mumford et al., 1994; Runco, 1994b). The differences between these and other problem construction-related skills lie in (a) how well- or ill-defined a problem is and (b) the degree to which ideation and evaluation are required

(Abdulla & Cramond, 2018). In our study, problem construction was operationalized as *problem discovery*, which has been considered as the highest level of PF hierarchy (Abdulla & Cramond, 2018). We asked the participants to produce as many ideas as they could think of for *different* and *novel* problems related to home and school, life situations, and health and well-being. They were explicitly instructed to think of real *or* hypothetical problems, and to think of problems that exist *or* those that might exist in the future. Previous work on instructions indicates that the focus of instructions can have a significant impact on the outcomes associated with DT measures (Acar, Runco, & Park, 2020; Nusbaum, Silvia, & Beaty, 2014; Runco, Illies, & Reiter-Palmon, 2005). The focus of the instructions is on both different and novel ideas may be one reason why flexibility was such an effective predictor. This point is crucial because different results might be attributed to the level of ideation and evaluation required in the problem construction task (Lee & Cho, 2007). Thus, our findings might not be generalized to all problem construction tasks, except those that require problem discovery where there is limited role for evaluation.

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Table 1
Selected Studies on the Relation Between DT and Problem Construction

Authors	DT Test	<i>N</i>	DT Skills	Task Nature	Main Findings
Frederiksen & Evans (1974)	• Consequences Test	• 395	• Fluency	• Verbal	• The correlation between fluency and five Formulating Hypotheses (FH) tests ranged from .05 to .34.
Arlin (1975)	• TTCT • Puzzles Test	• 60	• Expressional Fluency • Associational Fluency • Ideational Fluency • Adaptive Flexibility • Spontaneous Flexibility • Elaboration	• Verbal • Figural	• A positive correlation was found between PF quality and (a) elaboration, (b) adaptive flexibility, (c) and expressional fluency; a negative correlation was found between PF quality and (a) spontaneous flexibility, (b) ideational fluency, and (c) associational fluency. • A positive relation was found between PF quantity and (a) spontaneous flexibility, (b) ideational fluency, and (c) associational fluency. PF quantity was negatively associated with (a) elaboration, (b) spontaneous flexibility, and (c) expressional fluency.
Artley et al. (1980)	• TTCT	• 84	• Composite	• Verbal	• TTCT positively correlated with PF quantity, and negatively correlated with PF quality.
Wakefield (1985)	• DT Test developed by the author	• 23	• Composite	• Figural	• DT and PF were positively correlated.
Ambrosio (1993)	• TTCT	• 60	• Composite	• Verbal	• DT and PF quality were negatively correlated, whereas DT and PF and PF quantity were positively correlated.
Chand & Runco (1993)	• Presented Problems Test (PP) • Problem Generation Test (PG) • Discovered DT Test (DP)	• 80	• Fluency • Originality	• Verbal	• PG Test was positively correlated with fluency and originality with both PP and DP (ranged from $r = .31$ to $.51$).

Table 1 Continued
Selected Studies on the Relation Between DT and Problem Construction

Authors	DT Test	N	DT Skills	Task Nature	Main Findings
Hoover (1994)	• TTCT	• 40	• Fluency • Flexibility • Originality	• Verbal	• TTCT fluency was positively correlated with fluency in the FH test. • TTCT flexibility was positively correlated with fluency and originality in the FH test. No significant relation was found between TTCT originality and FH fluency and originality.
Reiter-Palmon et al. (1997)	• Consequences Test (Guilford, 1965)	• 195	• Ideational Fluency • Category Combination	• Verbal	• A negative correlation was found between problem construction and DT.
Lee & Cho (2007)	• TTCT	• 115	• Composite	• Verbal	• Ill-structured PF task was negatively correlated with DT, whereas PF and DT were positively correlated with the moderate problems.
Runco & Acar (2010)	• Uses Test	• 81	• Fluency • Originality	• Verbal	• DT fluency and originality were positively correlated with PF fluency and originality.
Jaarsveld et al. (2012)	• Test for Creative Thinking-Drawing Production (TCT-DP)	• 205	• Composite	• Figural	• DT and PF were not significantly associated.

Note: TTCT = Torrance Test of Creative Thinking; DT = Divergent Thinking; PF = Problem Finding

Table 2
Flexibility Categories for Verbal and Figural Tests

Task Nature	Categories
<i>Verbal</i>	
Spoon	(1) carry or move things, (2) care and beauty, (3) design and decoration, (4) artistic uses, (5) scientific uses, (6) recycling, (7) food and kitchen uses, (8) clean/cleaning, (9) stationery material, (10) game/use it in a game, (11) school/study uses, and (12) other uses*
Wheel	(1) carry or move things, (2) recycling and manufacturing, (3) decoration, (4) blocks, (5) shelter for pets, (6) container, (7) sport uses, (8) artistic uses, (9) musical instrument, (10) play and games, and (11) other uses*
Toothbrush	(1) cleaning, (2) care and beauty, (3) recycling, (4) artistic uses, (5) food and kitchen uses, (6) stationery material, (7) hanger, and (8) other uses*
<i>Figural</i>	
Spiral	(1) ideas/thoughts, (2) ropes, (3) nature (e.g., air, steam, smoke), (4) path/road, (5) food, (6) letters/numbers, (7) games, (8) tools, (9) trees, and (10) others*
Blocks	(1) places, (2) games, (3) geometric figures, (4) mathematics, (5) roads/crossroads, (6) machines, (7) part of the human body, (8) tools, (9) phone/tablets, (10) letter or words, and (11) others*
Lines	(1) road, (2) sorting things, (3) architecture, (4) stick/cane, (5) artistic and design uses, (6) furniture, (8) games, (9) musical instruments, (10) levels, and (11) others*

Note: *Others = all responses that did not fit any of the mentioned categories.

Table 3

Interclass and Internal Consistency Reliability Coefficients of Study Instruments

	ICC	Internal Consistency
Fluency - Uses	.81	.93
Flexibility - Uses	.84	.85
Originality - Uses	.83	.84
Fluency - Figural	.53 (.71)*	.61 (.73)*
Flexibility - Figural	.50 (.68)*	.64 (.69)*
Originality - Figural	.51 (.62)*	.55 (.62)*
Problem Generation - Fluency	.87	.88
Problem Generation - Originality	.87	.87

Note: * = After removing the Lines task; ICC = Interclass Correlation

Table 4
Correlations Between Study Variables ($n = 90$)

	Fluency (Uses)	Flexibility (Uses)	Originality (Uses)	Fluency (Figures)	Flexibility (Figures)	Originality (Figures)	Fluency (PG)	Originality (PG)
Fluency (Uses)								
Flexibility (Uses)	.87**							
Originality (Uses)	.93**	.72**						
Fluency (Figures)	.25*	.20	.26*					
Flexibility (Figures)	.29**	.24*	.30**	.89**				
Originality (Figures)	.27**	.27*	.30**	.80**	.73*			
Fluency (PG)	.73**	.75**	.67**	.22*	.26*	.28**		
Originality (PG)	.73**	.74**	.68**	.25*	.28**	.30**	.98**	

Note: Uses = Uses Test; PG = Problem Generation Test

* $p < .05$ ** $p < .01$.

Table 5
Regression Analysis of Divergent Thinking Skills with Problem Construction

Variable	<i>B</i>	<i>SE</i>	<i>t</i>	<i>p</i>	95% <i>CI</i>
Problem Construction (Fluency)					
<i>DT Verbal</i>					
Fluency	.03	.43	.08	.94	[-3.96–2.61]
Flexibility	1.17	.49	3.5	.001	[.741–2.69]
Originality	.52	.43	1.22	.227	[-.330–1.371]
	<i>R</i> ² = .59				
<i>DT Figural</i>					
Fluency	-.88	1.13	-.78	.435	[-3.14–1.36]
Flexibility	1.18	1.23	.957	.341	[-1.27–3.63]
Originality	1.13	.72	1.57	.121	[-.31–2.58]
	<i>R</i> ² = .08				
Problem Construction (Originality)					
<i>DT Verbal</i>					
Fluency	-.07	.36	-.19	.848	[-.787 - .648]
Flexibility	1.47	.41	3.6	.001	[.650–2.29]
Originality	.57	.36	1.6	.117	[-.146–1.29]
	<i>R</i> ² = .60				
<i>DT Figural</i>					
Fluency	-.66	.95	-.69	.49	[-2.55–1.23]
Flexibility	.94	1.03	.90	.37	[-1.12–2.99]
Originality	1.02	.61	1.67	.098	[-.19–2.23]
	<i>R</i> ² = .09				

Note: DT = Divergent Thinking

Figure 1. Line Chart of the Comparison Between the Number of Publications on Problem Construction, DT, and Problem Solving in the Past Five Decades.

Figure 2. Histogram of the Comparison Between the Number of Publications on Problem Construction, DT, and Problem Solving in the Past Five Decades.