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On the Relationship between Creative Problem Solving Skill and EFL Reading Comprehension Ability

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***Abstract*—The present study investigated the relationship between Creative Problem Solving (CPS) skill of Iranian secondary school students and their reading comprehension ability. The sample of participants included 70 second grade students randomly selected among secondary school students. The Torrance Test of Creative Thinking was used to measure CPS. Also, a valid and reliable teacher-made reading comprehension test was applied to asses reading comprehension ability of the participants. The results indicated that there was a positively significant correlation between reading comprehension ability and CPS skill. Among the sub-components of CPS, elaboration and originality revealed positively significant correlation with reading comprehension. Furthermore, the findings suggested a dire need of accommodating creativity and CPS techniques and activities in EFL materials, text book. Teaching creativity is highly recommended as a prerequisite for every kind of learning including foreign language learning.**

***Index Terms*—creative problem solving, creativity, reading comprehension, foreign language learning, classroom instruction**

I. Introduction

Creativity, as one of the most important human characteristics, is apparently an essential factor in development of human life condition. Despite the fact that the theoretical base of creativity still remains to be challenged, it is generally accepted that creativity can result in new, fruitful, meaningful, appropriate, and valuable outcomes; it can be an individual cooperative process; which can be influenced by various personal and environmental factors (e.g., Craft, 2000; Hennessey & Amabile, 2010; Le Métais, 2003; Plucker, Beghetto, & Dow, 2004; Sharp & Le Métais, 2000; Wang 2011). The need for effective thinkers who can locate and process knowledge is growingly considered as a primary goal of education (Rajendran, 2002). Creative problem solving (CPS) is regarded as an indispensable skill in general education both for children and adults since it can develop creativity of the learners and enhance the effectiveness of the education (Treffinger, 2003). As Piaget (2002) and Vygotsky (1986) mention, thinking skills are closely related to language development, thus it is highly possible that creative thinking has certain connection with reading and writing abilities.

A close association between the skills necessary for reading and writing was indicated over the years of research (Sturgell, 2008). Reading and writing seem to foster the traits which have the same characteristics and can increase creativity and help learners generate creative ideas and projects, for example Wang (2007) reported a positive correlation between creative ability of elaboration and writing scores but not math scores.

Ever developing world in twenty-first century necessitates skills for education and workplace that are no longer simply rooted on the rote learning of extensive content, but, the learners are required to become proficient in fundamental process skills such as: how to think, how to learn, and how to deal with new situations and problems in a perpetually changing world (Jacobs, 2010). Duffy and Cunningham (1996) believe that in problem solving process, students take more responsibility; become more independent and self-regulatory individuals.

In spite of the fact that many of the researchers have emphasized the role of creative problem solving, only a few studies have been carried out in the field of education up to now; and the effectiveness of CPS on the improvement of the foreign language learners' reading comprehension has been totally ignored.

Thus, this study aimed to investigate the relationship between CPS skill of the Iranian secondary school students (equal to elementary level EFL learners) in public schools and their reading ability in English.

II. Literature Review

Creativity brought about development in every aspect of human life, especially in educational domain. CPS process is regarded as the process of directing thought into generating diversified ideas best adaptable to the situation (Ellamil,

Dobson, Beeman, Christoff, 2012). A large number of studies have been conducted on the role of CPS in education and educational success, highlighting its essential value in solving complex individual, social, and global problems (Funke & Frensch, 2007; Greiff, Fischer, Wustenberg, Sonnleitner, Brunner, & Martin, 2013; Plucker, Beghetto, & Dow, 2004; Wüstenberg, Greiff, & Funke, 2012).

Webster's Dictionary deifnes CPS as "a question raised for inquiry, consideration, or solution". The word problem is referred to as any situation in which you have the chance to make a difference, to make things better; and problem solving is the process of converting an actual present state into a favorable future state and to increase the quality of life. Raven (2000) suggests that "problem solving involves initiating, usually on the basis of hunches or feelings, experimental interactions with the environment to clarify the nature of a problem and potential solutions, so that the problem-solver "can learn more about the nature of the problem and the effectiveness of their strategies" and "modify their behavior and launch a further round of experimental interactions with the environment" (p.54). Different – though somehow similar – definitions for CPS have been presented by the scholars the most prominent of which include: "a process while overcoming the difficulties in achieving the goal" (Bigham, 1985, p.10), "an effort to accomplish goal" (Schunk, 2004, p.203), "using knowledge to accomplish goals", "coping with problems" (Heppner and Peterson, 1982), "cognitive and behavioral process" (D'zurilla & Goldfried, 1971).

CPS model was introduced for the first time by Osborn's (1963) three-step model. It was later converted into a five - step model and finally a sixth-step model including: fact-finding, problem-finding, idea-finding, solution-finding, acceptance-finding, and mess finding (Treffinger & Isakson, 2005). Growing number of studies in the field of CPS paved the ground for the application of its models in education by redefining its value, reevaluating its structure, inducing a necessity for acquiring proficiency in meta-cognitive skills, and the process of profiling CPS (Treffinger, 1995).

The learners face a lot of challenges in the world of education which must tackle creatively in order to develop productive education. Robinson (2001) suggests that, creativity especially elaboration ability has a positive relationship with attitudes toward reading/writing and the time spent for thses skills. According to Houtz (2003), creativity or creative thinking skills can be improved. In addition, other researches strongly support the idea that good teacher and schools can improve students' overall CPS skills and the skills needed for creative thinking and that CPS can be taught and improved upon through practice (Isaksen & De Schryver, 2000). Gregory, et al., (2013) proposed simple, yet effective activities and pedagogical techniques that combine teaching of creative thinking with the teaching of subject matter content, without losing instructional time. Also, in a recent study on the relationship between extensive practice in reading/writing and creative performance, Amber (2011) concluded that creativity scores, especially scores of elaboration, are significantly correlated with attitudes toward reading/writing, and the amount of time spent on reading/writing.

In line with the reviewed literature and in order to fill its gap, the present study intended to investigate the relationship between Iranian secondary school students' CPS skills and their proficiency in reading comprehension in English as a foreign language to see whether CPS as an essential characteristic of language learners should be emphasized in a field of foreign language learning and teaching to foster improved results. So, considering the problem raised and according to the purpose of the research, this study seeks the answer to the following research question:

► Is there any relationship between Iranian secondary school students' CPS score and their reading comprehension ability?

III. Methodology

A. Participants

The participants of this study included 70 Iranian male second grade secondary school students in the study year 2014-2015. Because of the new modifications in Iranian educational system, reading comprehension is less emphasized in the first grade and the focus is more on oral communication. Since the new system is being applied for the last two years, there is not a third grade with the modifications in secondary school yet. The native language of the participants was Azeri. All of the participants were at the same age range, about 13-14 years old, so the age and mother tongue were not considered as intervening variables. Students were randomly selected from among eight schools in three cities, and two classes from each school.

B. Data Gathering Instruments

1. Torrance Tests of Creative Thinking

E. Paul Torrance as a pioneering scholar in creativity studies is famous for developing the Torrance Tests of Creative Thinking (TTCT) used to assess individuals' capacity for creativity (Torrance, 2003, p. B13). TTCT has two versions, the TTCT-Verbal and the TTCT-Figural. The TTCT-Verbal consists of two parallel forms, of A and B, each of which includes five activities as ask-and-guess, product improvement, unusual uses, unusual questions, and just suppose. Each task includes a picture to which respondents respond in writing or completing the picture (Torrance, 1966, 1974). The TTCT-Figural also has two parallel forms of A and B, both of which consist of three activities of picture construction, picture completion, and repeated figures of lines or circles.

In Activity I, the subjects draw a picture using a rabbit looking at an egg provided on the page as a stimulus. The stimulus must be an integral part of the picture construction. Activity II is presented as two incomplete lines out of which participants must make a picture by adding additional shapes and lines. Activity III presents ten diamond shapes on a page and the subjects are asked to try to create a picture with all, in a way all together they represent a story or an idea (Torrance, 1966, 1974, 1990, 1998; Torrance & Ball, 1984). For the last activity participants are presented with the subject to imagine the situation presented in second activity and write their answers in mother tongue.

In application of the test, Torrance (1966) emphasized to create a game-like, thinking, or problem-solving atmosphere, not a stressful threatening situation of testing. Thus in this test, examinees were encouraged to "have fun" and experience a psychological climate as comfortable and stimulating as possible (Torrance & Ball, 1984). Administration of the test takes 30 minutes and while minimum levels of drawing are acceptable test-takers have to manage their time (Chase, 1985). The TTCT-Figural appears has proved the required reliability and validity (Treffinger, 1995; Cooper, 1991) for the purposes of the test. TTCT follows the general purpose of research and experimentation along with specific applications for instructional planning and determining possible strengths of the test-takers.

According to the TTCT-Figural Manual of 1998, the reliability estimates of the creative index from Kuder–Richardson 21 using 99th percentile scores as the estimates of the number of items ranged between .89 and .94. The validity of TTCT has been proved through past studies (Cropley, 1971; Hébert, Cramond, Neumeister, Millar, Silvian, 2002; Torrance, Tan, & Allman, 1970; Witt, 1971) which increased the TTCT's credibility as a predictor of creative productivity. However, to verify the reliability of the instrument in Iran's EFL context in the present study alpha analysis was run and the results appeared to be 0.89.

2. Reading Comprehension Test

In order to measure the reading comprehension ability of the learners, a teacher-made reading comprehension test, with Cronbach's alpha reliability of 0.84, was used. The reading comprehension test was devised based on the material the learners had studied in the course book and was adjusted to their level of proficiency in EFL. The reading comprehension test contained four passages along with multiple choice and true/false questions, the format with which the participants are quite familiar from their textbook tasks. To reduce any cheating opportunity for test takers, three various forms of the same test was developed with modified order of choices and true false sentences. The face and construct validity of the test was approved by another expert. For scoring the test, each correctly answered test item was considered as one point and no penalty was considered for wrongly answered items.

C. Data Gathering Procedures

The participants were asked to take a reading comprehension test and Torrence's test of creative problem solving test. The tests were administered by assistances of the school consecutives in the early hours of school days at aforementioned sites. The tests were administered in 30 minutes. Before TTCT test, the teacher helped students with the instructions for each items. In order to prevent students' exhaustion, the two tests were administered on two distinctive days. To reduce any order effect of the instruments, counterbalancing was used. That is for almost half of the participants reading comprehension test was given first and then the Torrance test, and for the second half the opposite way round.

IV. Discussion & Analysis

The mean score and standard deviation for the reading comprehension and CPS tests were measured. Tables 1 and 2 present descriptive statistics of the reading comprehension and creative problem solving test, respectively.

TABLE 1:
DESCRIPTIVE STATISTICS OF THE READING COMPREHENSION ABILITY

	N	Minimum	Maximum	Mean	Std. Deviation
Reading	70	10	26	17.41	4.22

As Table 1 shows, the minimum score for reading is 10 and the maximum score is 26. Since the reading score was out of 26, the mean score of 17.41 reveals an average score.

TABLE 2:
DESCRIPTIVE STATISTICS OF THE CREATIVE PROBLEM SOLVING SKILL

	N	Minimum	Maximum	Mean	Std. Deviation
Creative problem solving	70	23.00	125.00	57.63	16.50
Fluidity	70	6.00	14.00	13.00	1.73
Flexibility	70	4.00	89.00	8.70	10.19
Originality	70	5.00	32.00	16.43	6.36
Elaboration	70	6.00	37.00	19.50	7.80

As Table 2 shows, the mean score for CPS was 57.63 with the standard deviation of 16.50. The mean score of fluidity was is 13 with the standard deviation of 1.73. The flexibility mean score of the students was 8.70 with the standard deviation of 10.19. The mean score of originality of ideas for the students was 16.43 with the standard deviation of 6.36. The mean score for the last subcomponent of CPS, elaboration of the ideas presented, was 19.50 with the standard deviation of 7.80.

The relationship between CPS skill and reading ability was investigated using Pearson product-moment correlation coefficient. The results are presented in Table 3. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity, and homoscedasticity.

TABLE 3:
CORRELATION BETWEEN READING COMPREHENSION ABILITY AND CPS SKILL

	Creative problem solving	Sig. (2-tailed)	N
Reading	.48**	.000	70

As shown in Table 3, there was a positively significant correlation between the two variables (r=0.48, n=70, p<0.0.5). Furthermore, the correlation between subcomponents of CPS and reading comprehension scores was investigated the results of which are presented in Table 4.

TABLE 4:
CORRELATION BETWEEN READING COMPREHENSION ABILITY AND SUBCOMPONENTS OF CPS SKILL

	Fluidity	Flexibility	Originality	Elaboration
Reading	.12	.13	.38**	.51**

Among the subcomponents of CPS, only originality (r=0.38, n=70, p≤0.05) and elaboration (r=0.51, n=70, p≤0.05) had positively significant correlation with reading comprehension. The other two subcomponents, namely fluidity (r=0.12, n=70) and flexibility (r=0.13, n=70) of the ideas, didn't reveal any significant correlation with reading ability.

To put it in a nutshell, this study was conducted to find out whether there is any relationship between creative problem solving ability of the Iranian secondary school students and their reading comprehension skill. The analysis of the results indicated that CPS of the students has significantly positive correlation with the reading comprehension abilities of the participants.

It is evident from the results that students who are more creative in facing new challenging situations are more likely to comprehend the texts better. This finding is in line with some previous studies. From other perspectives, researchers have indicated reading and writing are correlated with thinking (Moffett & Wagner, 1983; Pearson & Tierney, 1984; Stanford & Roark, 1974; Staton, 1984), and that instruction on reading and writing instruction improves critical thinking (Chapple & Curtis, 2000; Davidson, 1994). In other words, some studies have revealed that reading and writing can stimulate the creativity of the learners by providing resources for creativity (McVey, 2008; Sturgell, 2008). More similar results were obtained by a large body of research indicating that learning activities in the classrooms like reading and writing activities can contribute to creative development (Branowsky & Botel, 1974; Messman, 1991; Otto, 1991; Sak, 2004).

Among the sub-components of CPS, the scores of elaboration and originality were positively correlated with the score of reading comprehension which is in line with the results obtained by Wang (2007) who found out that extensive practice in reading and writing is related to high creative performance. His study revealed a correlation between creativity and attitude toward reading and writing.

Reading is a process of receiving and interpreting information encoded in language FORMS, via medium of print (Urquhart & Weir 1998). Comprehension is the result of extraction and integration of various information from text and combining it with previous knowledge (Koda, 2005). Reading comprehension has a relationship with some cognitive and metacognitive strategies, likes (a) activating background knowledge (Dole, Valencia, Greer, & Wardrop, 1991), (b) summarizing text (Armbruster, Anderson, & Ostertag, 1987), and (c) generating questions to capture the main idea of the passage (Rosenshine, Meister, & Chapman, 1996). Cognitive learning theory proposes that all learning follows a general path from cognitive learning to associative learning, to automatic learning (Anderson, 2000).

As it was mentioned, creative thinking, like processes involved in reading comprehension, occurs through some processes that involve cognitive and meta-cognitive processes. Thus, reading comprehension is a kind of decoding process of the problem. The results of this study revealed that students who enjoy high CPS skills, have a high levels of skills in reading comprehension. And also students with low CPS skills, have less skill in reading comprehension. Hence, it is evident that like other techniques and strategies such as increasing the lexicon schemata, mastery over the structure of language, overcoming the problem of unknown vocabularies, inference, and many other strategies, applying CPS techniques and strategies in teaching of reading skills as well as other language skills can be an effective way in improving the learners' reading skills. So far the language teachers have scarcely applied this psychological approach towards teaching of reading comprehension skills, but the findings of this study can encourage language teachers to get more familiar with CPS techniques and strategies and make use of them in their language classes specially for improving reading comprehension skills.

Among the subcomponents of CPS, elaboration and originality had a positively significant correlation with reading comprehension scores of the students. Originality of the idea is the number of statistically infrequent ideas; it presents the ability to provide uncommon or unique responses and elaboration is the number of added ideas; it demonstrates the ability to develop and elaborate on ideas. But two other subcomponents of CPS are revealed to have no significant relationship with reading comprehension. Because fluidity and flexibility just indicate the ability of the learners in providing answers, logical, true or not, they don't seem to help learners come up with better understanding of the passage. In reading comprehension students need to be aware of the goal they might adapt while reading and teachers need to be more sensitive to clarifying goals explicitly. Students also need to find out the main idea, supporting ideas and details. Thus, in reading comprehension readers directly or indirectly face original main ideas with some elaborated details which must be comprehended while reading. Thus, considering the organization of the ideas in a passage and focusing on originality and elaboration teachers can improve both CPS skills and effective ways of dealing with new passages.

Findings of this study can shed light on the issue of improving the quality of foreign language education in Iranian public schools by directing attentions towards considering CPS as an essential characteristic of learners which should be emphasized in foreign language learning and teaching. The results can also help curriculum developers to revise the teaching materials and incorporate more CPS techniques and activities in school text books.

Reading is one of the essential skills which help language learners develop their competence in foreign or second language. As an input device, reading is inevitable in every educational setting. The findings of this study can reveal the necessities in devotion of much more attention to the way through which reading comprehension is taught in foreign language classes.

The implications of the current study include:

1) Integrating creativity activities in the text books and classroom activities may foster creativity of the learners. Thus it may boost their achievements in their studies.

2) Creativity techniques can be practiced in the classroom, which can also be an important factor improving studying skills of learners.

3) In the case of teaching and learning English as a foreign language, integrating creativity techniques and activities in EFL text books and classrooms can encourage learners to think and prepare solutions in English which involves them more in learning experience and makes them more autonomous.

V. Conclusion

This study was conducted to find out if there is any relationship between creative problem solving ability of the Iranian secondary school students and their reading comprehension skill. The analysis of the results indicated that CPS of the students has significantly positive correlation with the reading comprehension abilities of the participants. Among the sub-components of CPS, the scores of elaboration and originality were positively correlated with the score of reading comprehension. Flexibility and fluidity in creative thoughts, however, didn't have a significant correlation with reading comprehension scores.

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