Can a creative interpersonal problem solving program improve creative thinking in gifted elementary students?

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\section*{Abstract}

Enhancing problem solving skills of gifted students provides them with essential tools for encountering future situations. Due to the necessity of problem solving skills in the lives of the gifted students, and inspired by the CPS model, along with parents need assessment surveys, a creative interpersonal problem solving training program was developed. Furthermore, its effectiveness on creativity of the elementary gifted students was evaluated. The design of the study was semi-experimental with pretest-post-test and control group. 125 female elementary students were screened by Raven Progressive Matrix of Intelligence and Persian version of Stanford-Binet test of intelligence. Those who qualified as gifted were randomly assigned into the experiment and control groups. The experimental group participated in the creative interpersonal problem solving program, and the control group did not receive the training, but was scheduled to receive the training program after the end of the research. While Torrance Test of Creative Thinking (Torrance, 1990, standardized Persian version, 1993 & 2008) was administered to measure creative thinking, creative performance was measured through Teacher Creativity Checklists (Proctor & Burnett, 2004). The obtained data were analyzed using Repeated Measures Analysis of the Variance. The findings showed significant differences \((p < 0.05)\) between the experimental and control groups in all sub-variables of creativity, and the results were maintained in the two-month follow up evaluation. In the end, applying creative interpersonal problem solving program for improving creativity in elementary gifted girls was discussed.

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\section*{1. Introduction}

There was a time that educators could tell their students to simply listen to their teachers in order to learn everything needed to be successful in the future; this might have been wrong even then, but it is certainly not true any longer, mainly because teachers do not even know the questions the future communities will face (Treffinger, 2007).

Life in 21st century is characterized by uncertainties. This is mainly because of social, economic, and technological changes in the world (Beghetto, 2010), which are revolutionizing the concept and characteristics of education (Craft, 2012). The next generation will need experiences and expertise in fields that are not even known yet. Although it is difficult to predict the required skills in the future world, it is obvious that students will need to be able to deal successfully with complex and
ill-defined problems in life. Creative thinking and problem solving skills are adjustable tools for successfully handling various kinds of unfamiliar problems which enhances constructive and adaptive behaviors in these new and demanding settings. These skills are crucial for all children, especially for the gifted children who are hoped to be the leaders and creators of the change in this uncertain and dynamic environment.

1.1. Gifted students

Gifted students have special characteristics that might put them at more risk in regards to their socio-emotional development and well-being because of their differences with other children, or the asynchrony or dysynchrony between their social, emotional, and cognitive development (Gallager, Smith, & Merrotsy, 2013). Among these characteristics are perfectionism (Fong & Yuen, 2014; Orange, 1997; Reis & Renzulli, 2004; Siegle & Schuler, 2000; Speirs Neumeister, Williams, & Cross, 2009), underachievement (McCoach & Siegle, 2001), and loneliness (Robinson, 2006; Shechtman & Silektor, 2012; Vialle, Heaven, & Ciarrochi, 2007). Furthermore, some of these students are struggling with internal tensions, which might manifest as maladaptive behaviors. Because of vulnerabilities of gifted students and their social and emotional needs (Cross, 2014; Freeman, 2006) in different aspects of their lives, problem solving training might assist them in overcoming some of these obstacles in their lives, and blossom their gifts and their full creative potentials, which enable them to achieve the solutions for their communities and lead societies into prosperity.

1.2. Problem solving

A problem might be defined as a situation with a goal and an obstacle, or a gap between a current and a desired situation, in which a problem solver wants to achieve a goal, but first the obstacles need to be dealt with. The process of problem solving is transforming “what is” into “what should be” (VanGundy, 2005). It is also defined as any life situation or task, which demands a response for adaptive functioning, but no effective response is immediately available because of one or more obstacles (D’Zurilla, Nezu, & Maydeu-Olivares, 2004). When dealing with a well-structured, closed-ended problem, individuals need convergent thinking abilities, while ill-defined, open-ended problems require the problem solvers to acquire and apply divergent thinking capabilities (Pretz, Naples, & Sternberg, 2003). Ill-defined problems have multiple appropriate solutions, each might satisfy slightly different problem solving goals. Furthermore, some problems involve a dilemma, in which you have two options, neither of which resolves the problem completely, and choosing each option contains gaining some and losing some desired results (Runco, 2014).

1.3. Social problem solving

Social problem solving is a self-directed cognitive-affective-behavioral process, by which an individual or a group attempts to find effective solutions to resolve problems they encounter in real life, social environments (D’Zurilla & Nezu, 2010). Traditional problem solving models usually consist of a series of cognitive steps including: problem identification, goal setting, finding alternative solutions, and evaluating problem solving outcomes (Fogler & LeBlanc, & Rizzo, 1995; Pretz et al., 2003). In social problem solving approach, there is more focus upon motivational, affective, and behavioral aspects of problem solving. Social problem solving model indicates that effective problem solving depends on a positive orientation towards problem solving and use of problem solving skills. Social problem solving is a conscious, rational, effortful, and purposeful activity to improve a problem situation, and reduce or modify the negative emotions generated by the situation. Social problem solving assists individuals to solve all types of real-life problems by identifying and discovering effective solutions for specific problems encountered in everyday life (D’Zurilla et al., 2004; D’zurilla & Nezu, 2010). Interpersonal problem solving has a great impact on perspective taking competency, adjustment (D’Zurilla & Maydeu-Olivares, 1995), and well-being (Elia et al., 1986; Parkinson & Creswell, 2011), preventing depression (Becker-Weidman, Jacobs, Reinecke, Silva, & March, 2010; Bell & D’Zurilla, 2009), preventing and managing stress and anxiety (D’Zurilla & Sheedy, 1991; Kant, D’Zurilla, & Maydeu-Olivares, 1997; Wilson & Hughes, 2011), and promoting social skills (Webster-Stratton & Reid, 2004). It can be integrated with behavior management programs (Guervmont & Foster, 1993) and relationship management in conflict resolution in parent-child relationship, and family emotional health, well-being, and quality of life (Siu & Shek, 2005).

An interpersonal cognitive problem solving program (ICPS) for children was developed based on the idea of teaching the students how to think instead of what to think. The effectiveness of training of this program was investigated in different studies (Shure, 2001; Shure & Aberson, 2013).

Social problem solving as solving problems was studied by focusing on problem construction, more specifically in case of ill-defined and ill-structured issues (Reiter-Palmon, Mumford, & Threfall, 1998; Reiter-Palmon & Robinson, 2009). Mumford, Reiter-Palmon, and Redmond (1994) suggested a cognitive process model of problem construction. The base of this problem construction is problem representation, formed by the past experiences, guiding the individual in constructing and solving problems similar to those encountered in the past experiences or in structuring novel problems. This framework can be applied to any kind of problems that individuals might encounter in their everyday lives, which might be ill-defined and ambiguous with no specific goals or no pre-defined criteria for determining good solutions (Reiter-Palmon, Mumford, O’Connor Boes, & Runco, 1997).
1.4. Social innovation

Mumford (2012) proposed a form of creativity in social context, as social innovation, which is generation and implementation new ideas about how individuals should organize interpersonal activities, or social interactions, to achieve one or more common goals. In this study, applying social innovation theories in the lives of historical figures was analyzed and it was concluded that their applied problem solving process included: problem identification, carefully analyzing causes, generating contextually appropriate low-cost implementation strategies, and building the needed support for the projects (Marcy & Mumford, 2007; Mumford, 2012).

1.5. Creativity

Although there is no agreement on definitions of creativity, various definitions agree on originality and usefulness as the two most important characteristics of the creative ideas or products (Runco & Jaeger, 2012). Studies repeatedly show that creativity can be improved (Fasko, 2001) and the effectiveness of the creativity training programs on different populations have been investigated (Benedek, Fink, & Neubauer, 2006; Kassim, Nicholas, & Ng, 2014; Poon, Au, Tong, & Lau, 2014). Furthermore, there have been meta-analysis conducted on the creativity training programs and the results showed that well-designed creativity training programs were effective in improving creativity across criteria, setting, and population (Ma, 2006; Rose & Lin, 1984; Scott, Leritz, & Mumford, 2004).

Also different studies show that solving problem solving training process would improve creativity by inducing active engagement in the problem identification and construction (Reiter-Palmon & Robinson, 2009). Creativity is also important in improving problem solving and other cognitive abilities, healthy social and emotional well-being (Forgaard & Eichner, 2014), and academic success: Also, creativity training showed to be effective in assisting students in solving interpersonal and intrapersonal problems (Plucker, Beghetto, & Dow, 2004). Also creativity, innovation, and ways to enhance them in organizational settings have been studied (Amabile, 1996; Birdi, 2007; Mumford, 2012). Creativity training programs for gifted students have been investigated in different studies (Feldhusen, 1973; Subotnik, Edmiston, Cook, & Ross, 2010; Treffinger & Isaksen, 2005). Among different creativity training programs is Future Problem Solving program, which was originally developed by Torrance to enable the participants to develop their creative thinking, and become more aware and hopeful about the issues they would encounter in their future lives and the influence of their actions. Torrance encouraged his students to apply the Creative Problem Solving process developed by Alex Osborn to investigate different problems related to their future lives (Crabbe, 1982; Torrance, 1978). Future Problem Solving and its effectiveness were evaluated in different studies (Duñer, 1998; Frasier, Lee, & Winstead, 1997). Also, Tallent-Runnels and Yarbrough (1992) showed that there was a significant difference in the degree of control gifted students participating in this program felt over their future, compared to other gifted or average-ability students.

The relationship between problem solving and creativity is extensively debated. Some believe that creativity is a kind of problem solving, while others believe the opposite (Reiter-Palmon & Illies, 2004; Runco, 2014). However, it is obvious that there is a relation between the two, since they share many required underlying processes including problem identification and construction, identification of relevant information, generating new ideas and evaluation of these ideas (Reiter-Palmon & Illies, 2004).

1.6. Creative problem solving

Problems that are well-defined and well-structured might be solved by general problem solving process; however most real life problems are not clearly defined and structured. For well-structured problems, the current state, the desired state and ways to close this gap is definitely known. On the other hand, ill-structured problems provide very little guidance or structure about ways to solve the problem, in which there are many possible options, but no guaranteed clear-cut ways to achieve the best solutions. Interpersonal problems are usually complicated and involve considering many complicated feelings, which rules out applying the traditional problem solving techniques. Also, since there is often no single right or wrong answer to interpersonal issues, effective solutions can be achieved through a creative approach to interpersonal problem solving (VanGundy, 2005).

Creative Problem Solving is a multi-step process, which provides a practical set of tools for solving complex, open-ended problems by applying both divergent and convergent thinking (Treffinger, 2007). It empowers the problem solvers to define their problems, generate ideas, transform ideas into solutions, and construct action plans using both divergent thinking (generating many alternatives) and convergent thinking (screening, selecting, and evaluating). This balance is the hallmark of CPS (Puccio, Firestein, Coyle, & Masucci, 2006). Nowadays, many issues facing the students and their families can be categorized as ill-defined and ill-structured, since there are no pre-defined answers and solutions to embrace. Teaching creative problem solving would provide the students with appropriate tools to solve tremendously various future problems rather than helping them solve any particular problem (Reiter-Plamon & Illies, 2004; Shure and Aberson, 2013).

Creative problem solving (CPS) training has been applied to foster creativity in many studies. Some of these studies are presented in the following section.
1.6.1. Creative problem solving for children

Creative problem solving training for children was considered in a few studies. For example, Tulumello (2009) used storybooks to teach children the creative problem solving techniques, and concluded that the students as young as first graders are able to comprehend some higher order thinking creative problem solving concepts and tools.

Teaching creative problem solving to young children was studied by Puccio (1994), in which she used qualitative data from teachers, observers and students and concluded that the elementary students are mostly capable of understanding and applying CPS techniques. However the degree of the students’ understanding depends on their abilities, their involvement, and the instructed stages of CPS. Recently, Cetinkaya (2014) instructed creative problem solving to middle school students and showed that there were significant differences between the control and the experimental group in their creativity measured by Torrance Test of Creative Thinking.

Also CPS training for different groups of children and adolescents was investigated by McCluskey, Baker, and McCluskey (2001). In the “second chance” project, along with career exploration and mentoring, CPS was instructed to Native Canadian inmates, and a significant decrease in recidivism rate occurred (Place, McCluskey, McCluskey, & Treffinger, 2000). A similar program called “Lost prizes”, improved the lives of talented, but troubled high school dropouts (McCluskey et al., 2001).

1.6.2. Creative problem solving in organizations and universities

CPS was trained in many research studies to enhance the creativity level in organizations (Basadur, Pringle, & Kirkland, 2002; McCluskey et al., 2001; Sousa, Monteiro, & Pellissier, 2011; Sousa, Monteiro, Walton, & Pissarra, 2014; Thompson, 2001). Wang and Horne (2002) trained creative problem solving to 106 workers in a petroleum company resulted an increase in fluency and flexibility in Torrance Test of Creative Thinking. It also increased research performance of the participants, even months after the intervention.

Kabanoff and Bottger (1991) evaluated the effectiveness of creative problem solving training program for students in a Master of Business administration program. The workshop was successful in increasing creativity sub-variables, especially originality in the participants.

Basadur, Runco, and Vega (2000) also trained creative problem solving in a 20-h workshop to 112 managers. As the result of this intervention, active divergence increased and tendency for premature evaluation of options decreased. Basadur, Wakabayashi, and Takai (1992) also investigated the effectiveness of creative problem solving training on Japanese managers. The results showed that similar to the American population, active divergent thinking increased, and tendency towards premature convergence decreased.

Based on the results of these studies and the necessity of designing such a program for gifted students, a creative interpersonal problem solving training program was designed and implemented for gifted students. Effectiveness of this program was investigated with this research question: can a creative interpersonal problem solving program improve creativity and its sub-variables: fluency, flexibility, originality, and elaboration?

2. Method

2.1. Participants

125 fourth-grade students in an all-girl, middle-class elementary school in northern Tehran volunteered to participate in this research. Although intelligence was measured as a significant part of the school entrance exam, it was evaluated by the present researchers more comprehensively using Raven Progressive Matrix of Intelligence (1938) and Iranian version of Stanford-Binet test of intelligence (Afroz & Hooman, 2011), and only those with IQ scores above 130 were assigned randomly in the control and experimental groups (each included 21 students). Age, gender, grade, class curriculum, and socio-economics status, and intelligence was controlled. The informed consent were obtained, and the experimental group consisting of 21 students experienced the interpersonal creative problem solving package, while the students in the control group were invited to a wait list group who received no special treatment during the current research, but received a shorter version of the program after the research ended.

2.2. Materials

Following pre-testing of both control and experimental groups by Torrance Test of Creative Thinking Figural test form B, teachers of both classes answered to creativity checklists. Afterwards, the experimental group received the Creative Interpersonal Problem Solving instruction for 15 sessions, and the control group did not receive any special treatment during that period. Since the program was conducted in an elementary school setting, nobody left the program: in case of students’ absences, make-up testing and repeated program activities were arranged. Post-testing was conducted approximately 4 months later; the students answered to Torrance Test of Creative Thinking Figural form A, and teachers answered to the Creativity checklists again.
2.3. Procedure

Being inspired by the Osborn-Parns CPS model (Treffinger & Isaksen, 2005), which has been further developed as the CPS version 6.1 (Treffinger, Nassab, Schoonover, & Selby, 2006), a creative interpersonal problem solving was developed focusing on the challenges that are faced by these students and the issues suggested by the students, their parents and teachers.

In other words, keeping a creative problem solving framework in mind, lesson plans were tailored into the social context of the participants. Creative problem solving approach was applied in the social problem settings of the targeted participants; the program incorporated many family culture and moral values, which were suggested through semi-structured interviews, conducted with the families and teachers of the students, in which they were asked to pinpoint their most challenging issues in regards to their interpersonal relationship with their daughters or their students. Afterwards, a survey was made based on the frequency of the issues put forward in these interviews and was presented to the rest of the parents and teachers. For instance, the issues of emotional management, anger management, peer pressure, bullying, and impatience, were among the most talked about issues. Therefore, in this survey, parents were asked to rate the degree of their concerns about each of interpersonal issues, on the scale of 1–10. Once again, parents’ and teachers’ answers to the survey were put into a table, according to the significance of each topic. CPS tools and stages were connected to each of the parents’ concerns based on how they fit together. For the purpose of designing each of the lesson plans and activities, a combination of both tables were taken into consideration. In other words, the purpose of each of the lesson plans were to apply one of stages or tools of the Creative Problem Solving process to resolve an interpersonal problem mentioned in the parents’ concerns table. That means while the underlying theme applied in every topic was an interpersonal problem solving, for which the tools of CPS were introduced and applied; For example a session was dedicated to using CPS generating tools (brainstorming, SCAMPER, and attribute listing) for the purpose of finding friends or coping with peer pressure, in which tools were drawn from the CPS model, and friendship and coping with peer pressure were drawn from the parents’ interviews and surveys. Having this goal and format in mind, content of this program was designed and the tool kit which included suitable story books, puppets and puppet show scenarios, worksheets, matching cards, boards, and toys were provided. Due to important role of play in improving creative attitude and performance (Chang, 2013; Ramani & Brownell, 2014), playful activities were designed for all lessons.

Creative interpersonal problem solving program included 15 sessions of instruction (see Table 1), which were reviewed and approved for content and face validity by 10 professionals in this field. The sessions were 45 min long, and the exercises were designed and conducted by the first author.

3. Measures

3.1. Creative thinking

Torrance test of Creative Thinking: Creative thinking of the participants were evaluated using Torrance Test of Creative Thinking (1990) which stemmed from Guilford’s creativity research and was re-normed five times in 1974, 1984, 1990, 1998, and 2007 (Kim, 2006, 2008), and remains the most widely used test of creativity. The figural form of Torrance test of creative has alternative forms: A and B. In this research form B was administered as pretest, form A for post-test, and form B again for follow up evaluation, which consist of three subtests: a) picture construction; b) picture completion and c) parallel lines in form A and circles in form B. The figural form takes approximately 30 min to administer, and was chosen in this study, since it contained less cultural issues compared to the verbal form. Test-retest reliability for the figural test ranges from 0.78 to 1.00 at different age levels. Construct validity is moderately high (r = 0.51) based on comparison with the TTCT verbal test (Torrance, 2000). This test was conducted on Iranian student sample by Pirkaehfi (1993), and test-retest reliability of 0.78 in fluency, 0.74 for originality, 0.81 for flexibility, and 0.90 in elaboration was reported. Also in 2008, it was conducted on 120 Iranian students and reported 0.94 for originality, 0.72 for fluency, 0.70 for flexibility (Pirkaehfi, 2008). The scales were administered by the first author to both classes and were scored by the researcher through a blind process, in which the names and class names of the examinees were removed and they were shuffled, so while scoring, the researcher was not aware of the group to which the examinee belonged. The researcher studied the manual closely, and was trained by the institute in which figural form of Torrance test of creative thinking was standardized for the Iranian population.

3.2. Creativity performance

The creativity checklist (CCh) Johnson (1979) was also given to the teachers to rate the observed creativity performance of each student, to measure other aspects of creativity rather than only divergent thinking. The primary reason for the selection of the CCh among other creativity checklists was the availability of an Iranian version that could be used in conjunction with the TTCT. The CCh was created in relation to Torrance’s sub-variables of creativity including fluency, flexibility, resourcefulness, constructional skill, ingenuity, independence, and positive self-referencing behavior.

The CCh incorporates eight items, designed to measure the teachers’ systematic identification of overt creativity based on direct observation. Each item is rated on the basis of teachers’ evaluation of the creative behaviors, demonstrated by the individual, and are scored on a scale ranging from 1 = never to 5 = consistently. Each individual’s total creativity score is obtained by summing across all eight items. Total CCh scores may range from a minimum of 8 to a maximum of 40. In using
Table 1
Content of the creative interpersonal problem solving program sessions.

<table>
<thead>
<tr>
<th>session</th>
<th>Interpersonal problem solving topic</th>
<th>Problem solving topic</th>
<th>CPS topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>• Introduction to the program</td>
<td>Introduction to alternative solutions, divergent thinking</td>
<td>Introduction to “constructing opportunities”</td>
</tr>
<tr>
<td></td>
<td>• Applying alternative ways in interpersonal relationships</td>
<td>Practice of ps. stairway in peer pressure</td>
<td>Creative thinking tool: Force fitting</td>
</tr>
<tr>
<td>2</td>
<td>Emotional management: noticing own and others’ feelings</td>
<td>Stating the involved feeling in the first step of the ps. stairway</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Applying steps of interpersonal problem solving stairway</td>
<td>Practicing the steps of interpersonal ps. stairway</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Applying brainstorming tool in interpersonal relations</td>
<td>Introducing brainstorming tool in idea generation</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Problem solving instead of complaining</td>
<td>Practicing the steps of interpersonal ps. stairway instead of complaining</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Applying ps. in order to stop bullying</td>
<td>Practice of ps. stairway in order to stop bullying</td>
<td>More practice of “ED” stage. In regards to bullying</td>
</tr>
<tr>
<td>7</td>
<td>• Introducing idea generating tools in regards to a physical object like a chair</td>
<td>Hints are provided for transferring tools to interpersonal issues</td>
<td>Introduction to “Framing problems” Idea generating tools: brainstorming, force-fitting, and attribute listing</td>
</tr>
<tr>
<td></td>
<td>• Brainstorming, Force-fitting, Attribute listing about improving a chair</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Generalization hints to interpersonal issues are offered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Confronting peer pressure (idea generating)</td>
<td>Practice of ps. stairway in peer pressure</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Confronting peer pressure (focusing ideas)</td>
<td>Practice of ps. stairway in using focusing tools in confronting peer pressure</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Ps instead of anger, managing triggers, keeping calm, ways to express anger</td>
<td>Practicing ps. stairway in anger triggering situations</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Constructive criticism</td>
<td>Practice of using ps. stairway in making constructive criticism</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Friendships, finding and keeping friends, initiating relations</td>
<td>Practice for using ps. stairway in finding and keeping friends</td>
<td>Applying SCAMPER in finding friends, stage of “Developing Solution” applying force fitting, ALoU, evaluation matrix, introducing paired comparison analysis</td>
</tr>
<tr>
<td>13</td>
<td>Patience confronting problems that cannot be solved in the short-term, like pollution, war, or natural disasters</td>
<td>Practice of using ps. stairway + patience (when you cannot achieve the plan A, do your best in achieving plan B)</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Perspective taking</td>
<td>Ps stairway, with thinking about others’ feelings and concerns</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Golden Rule: “Do to others what you would have them do to you”</td>
<td>Exploring outcomes of actions through other’s point of views keeping in mind the golden rule</td>
<td>Introduction to Appraising task and Designing Process</td>
</tr>
<tr>
<td>16</td>
<td>Interpersonal Creative Problem Solving celebration: “Problem? What problem? We embrace our problems”</td>
<td></td>
<td>Awards of “Interpersonal Creative Problem Solving” celebration were handed</td>
</tr>
</tbody>
</table>

The CCh, every effort should be made to observe and evaluate students in as many settings and content/task areas as possible, in which creativity is demonstrated and can be observed. Johnson (1979) reported a correlation of \( r = 0.56 \) with the TTCT. The Cronbach’s alpha coefficient for the CCh was \( r = 0.98 \) and a positive correlation \( r = 0.51 \) was also found between the TTCT and CCh (Hosseini & Watt, 2010).

Furthermore, since CCh was an old checklist, Proctor and Burnett Creativity Checklist (2004), which was used more recently in the creativity literature was also used along with the other measures. This checklist contains subscales of fluent thinker, flexible thinker, original thinker, elaborative thinker, intrinsically motivated learner, self-confident/independent learner, curious learner, risk taker, and imaginative thinker. Classroom teachers would rate their students’ creative behavior on the scale of 1–4, based on their observation. Validity and reliability of the checklist were measured and reported (Jamieson-Proctor & Larkin, 2012; Proctor & Burnett, 2004), however it is best used as a comparison tool for students groups (Kaufman, Plucker, & Russell, 2012).
Table 2
Means of four sub-variables of creativity in three stages of pretest, post-test and follow-up.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>mean</td>
<td>SD</td>
<td>mean</td>
</tr>
<tr>
<td>Fluency</td>
<td>E: (n=21)</td>
<td>24.23</td>
<td>7.84</td>
<td>34.57</td>
</tr>
<tr>
<td></td>
<td>C: (n=21)</td>
<td>31.33</td>
<td>5.86</td>
<td>32.28</td>
</tr>
<tr>
<td>Flexibility</td>
<td>E: (n=21)</td>
<td>17.33</td>
<td>5.18</td>
<td>27.90</td>
</tr>
<tr>
<td></td>
<td>C: (n=21)</td>
<td>21.16</td>
<td>3.93</td>
<td>22.71</td>
</tr>
<tr>
<td>Originality</td>
<td>E: (n=21)</td>
<td>28.76</td>
<td>17.72</td>
<td>76.52</td>
</tr>
<tr>
<td></td>
<td>C: (n=21)</td>
<td>47.66</td>
<td>11.25</td>
<td>41.28</td>
</tr>
<tr>
<td>Elaboration</td>
<td>E: (n=21)</td>
<td>41.19</td>
<td>27.56</td>
<td>162.66</td>
</tr>
<tr>
<td></td>
<td>C: (n=21)</td>
<td>76.14</td>
<td>15.57</td>
<td>71.47</td>
</tr>
</tbody>
</table>

SD: Standard Deviation.

Table 3
Results of profile analysis for comparing means of creativity in three stages of pretest, post-test and follow-up.

<table>
<thead>
<tr>
<th>Source</th>
<th>Estimation</th>
<th>df (hyp.)</th>
<th>df (error)</th>
<th>F</th>
<th>sig</th>
<th>ES</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time × group</td>
<td>Wilks' Lambda</td>
<td>8</td>
<td>154.0</td>
<td>17.23</td>
<td>0.0001</td>
<td>0/47</td>
<td>1/0</td>
</tr>
</tbody>
</table>

ES: Effect size, df: degree of freedom.

Table 4
Results of the Repeated Measures Analysis of Variance for four sub-variables of creativity in three stages of pretest, post-test and follow-up.

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>sig</th>
<th>ES</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time × group (fluency)</td>
<td>720.4</td>
<td>2</td>
<td>360.2</td>
<td>11.39</td>
<td>0.0001</td>
<td>0.22</td>
<td>0.99</td>
</tr>
<tr>
<td>Time × group (flexibility)</td>
<td>911.47</td>
<td>1.84</td>
<td>493.65</td>
<td>27.1</td>
<td>0.0001</td>
<td>0.40</td>
<td>1.0</td>
</tr>
<tr>
<td>Time × group (originality)</td>
<td>23584.42</td>
<td>1.55</td>
<td>15150.36</td>
<td>66.86</td>
<td>0.0001</td>
<td>0.62</td>
<td>1.0</td>
</tr>
<tr>
<td>Time × group (elaboration)</td>
<td>132622.58</td>
<td>1.36</td>
<td>97381.88</td>
<td>84.71</td>
<td>0.0001</td>
<td>0.68</td>
<td>1.0</td>
</tr>
</tbody>
</table>

SS: Sum of squares, MS: Mean Square, Sig: Significance, ES: Effect size.

Table 5
Means of creativity checklists in three stages of pretest, post-test and follow-up.

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Creativity Checklist (Johnson)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>23.76</td>
<td>5.97</td>
<td>33.71</td>
</tr>
<tr>
<td>C</td>
<td>26.33</td>
<td>10.80</td>
<td>25.9</td>
</tr>
<tr>
<td>Creativity Checklist (Proctor &amp; Burnett)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>40.40</td>
<td>6.85</td>
<td>46.86</td>
</tr>
<tr>
<td>C</td>
<td>38.42</td>
<td>10.99</td>
<td>37.80</td>
</tr>
</tbody>
</table>

M = mean, SD = Standard Deviation, E = Experimental, C = Control.

4. Results

The research question of “can a creative interpersonal problem solving program improve creativity and its sub-variables: fluency, flexibility, originality, and elaboration” was investigated and the following results were achieved:

4.1. Torrance test of creative thinking

Torrance Test of Creative Thinking form B for pretest, form A for post-test and form B for the follow up stage were administered and results for four sub-variables of fluency, flexibility, originality, and elaboration are presented in Table 2.

The results of the Repeated Measures Analysis of Variance show that there are significant differences between means of sub-variables of creativity for the experimental group in the pretest stage to post-test stage, and the control group in the pre-test to post-test stage (see Tables 3 and 4).

4.2. Johnson and Proctor & Burnett creativity checklist

Table 5 shows that the post-test, and follow up means of the creativity checklists of Johnson, and post-test mean of Proctor and Burnett Creativity Checklist of the experimental group increased compared to the means of the control group. It means that the participants in this study were rated higher in their creativity by their teachers after the intervention, compared to the control group.
Table 6
Results of repeated measures analysis of variance for comparing means of Johnson creativity checklist.

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>sig</th>
<th>ES</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time × group (Johnson)</td>
<td>811.44</td>
<td>2</td>
<td>405.72</td>
<td>65.30</td>
<td>0.0001</td>
<td>0.62</td>
<td>1/0</td>
</tr>
<tr>
<td>Error</td>
<td>496.98</td>
<td>80</td>
<td>6.21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time × group (proctor &amp; Burnett)</td>
<td>219.65</td>
<td>1</td>
<td>219.65</td>
<td>46.0</td>
<td>0.0001</td>
<td>0.57</td>
<td>1.0</td>
</tr>
<tr>
<td>Error</td>
<td>162.34</td>
<td>34</td>
<td>4.77</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

M = mean, SD = Standard Deviation, E = Experimental, C = Control.

Table 7
Example of an activity of creative interpersonal problem solving program.

**Friendship, Forced association for making friends**

**Objective:** students will be able to use “forced association” technique in making friends.

**Materials needed:** copy of problem solving ladder worksheet, copy of forced association worksheet (page 37 in the worksheet booklet) and power point slides (page 40).

**Introduction:** to activate prior knowledge, talk about the importance of friends and friendship in an individual’s life, unfriendly and friendly behaviors in making and keeping friends. Also, refresh their memory about other creativity techniques, which were introduced in the previous lessons: brainstorming and attribute listing, and their application in interpersonal relationships.

1. Introduce forced association.

   Today, we want to talk about another tool that helps us to create new ideas. You think of something totally different and its characteristics and try to get ideas from that to improve what you have. For example, when you want to improve your chair and think of a car… the car has a trunk, so you give a hidden drawer to the chair, the car has wheels, so you give wheels to our chair, and ….

2. Provide different examples using pictures. Provide the students with play dough and match sticks, and ask to make a creative chair using the materials. Assist the students to think of something they are interested and borrow interesting features from that to the chair they are building.

3. Provide the students with forced association worksheet and help them to go through it to make their chair unique.

4. Provide them with another clean forced association worksheet and ask them to think of Mona’s problem: Suggest different ideas to Mona, who wants to become friends with Sara.

5. At first, ask the students to come up with suggestions without any help. Later, remind them of the newly-learned technique: to think of something which seems totally different, but helps them think of new ideas and suggest to Mona for making friends with Sara:

   Introduce forced association technique as a tool for making new friends.

   Think to find solutions to Mona’s problem?

   - Computer
   - Bike
   - Candle
   - Car

   Mona can convince Sara that she can be a good friend?

   Send them email, make an email group and send interesting emails
   ![image]

   Give them her bike, let them ride on the back, make a bike club or a competition
   ![image]

   Candle on the table, turn off the lights and read poems, watch horror movies, do homework around the candle, make birthday cake and blow out the candles
   ![image]

   Ask her dad to ride them on his car, start a carwash, in the car, go to imaginative trips, put flowers on the car, play bride & groom in the car, play hide & seek around the car

   ![image]

The results of Repeated Measures Analysis of Variance also show the difference between the means of Johnson creativity checklist and Proctor and Burnett creativity checklist in the post-test stage of the experimental group significantly increased compared to the students in the control group (Table 6).

5. Discussion and conclusion

Applying creative problem solving model in the interpersonal problem solving context makes experimenting and manipulating different issues concerning interpersonal relationships possible, or rather necessary. In this study, it also improved all sub-variables of creativity, fluency, flexibility originality, and elaboration. The students participating in this study were encouraged to apply creative problem solving tools for solving ill-structured problems in their interpersonal interactions. They were encouraged and assisted to look for the multiple substitute solutions enabling them to solve their interpersonal problems such as encountering bullying, offering and receiving constructive criticism with the help of offered tools. Results of the present research showed that students in the experimental group, who participated in the creative interpersonal problem solving program statistically outperformed the students in the control condition in their creative thinking. It seems having discussions in several lessons on how thinking and using different ideas and solutions, and not following the first idea that comes to mind might have lead the students to have more flexibility, originality and elaboration in everything they do, including in the post-test and the follow up stages of the creativity test. In the post-test, participants have the most enhancement in the originality sub-variable, which was the main concern of the program, to get the participants’ minds stimulated with different techniques to generate more sophisticated and unique ideas. Although these ideas were mostly discussed in the interpersonal relationships, the gifted participants were able to generalize this newly-learned creative attitude to other areas of their lives (Table 7).

The results of this study are consistent with many previous studies, such as McCluskey et al. (2001), and Lee and Hoffman (2014), which were conducted as efforts to enhance creativity by training CPS process. Although these studies employed
different research methodologies, they all resulted in increasing creativity of their participants. This study showed creativity can be increased and the creative interpersonal problem solving program that was designed based on Osborn-Parns CPS method was actually successful in igniting the creative thinking abilities in the gifted elementary girls participating in the study.

6. Limitations

One of the limitations of this study is the fact that the follow up time for the results was only two months away, and the maintenance of the results is not measured in longer periods. Instructing the same curriculum to a larger sample would increase the generalization of the results of this study. Also having workshops for the parents and teachers of the participants might have improved the impact, which was not conducted due to possible interference with the current training. Another limitation might be the fact that motivation and self-efficacy is not measured and controlled, since being in the class that was chosen to receive the special curriculum with interesting activities might have influenced performance of the experiment group.

Conducting interpersonal creative problem solving workshops for parents and teachers of the students under training, and having longer follow-ups are recommended for future studies. Having the curriculum available to other classroom teachers and school administration for the purpose of training different groups of students is highly recommended to the interested future researchers.

References


 Gallager, S., Smith, S., & Merrotys, P. (2013). You turn up the first day and they expect you to come back! Gifted students’ perspectives on school and being smart. Gifted and Talented, 28(1), 111–121.


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