

Effectiveness of a Creative Problem-Solving Skills Training Package on Self-Efficacy and Personal Growth Initiative in Students

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Article Info

Article type:

Original Research

How to cite this article:

Dadvand, F., Manzaritavakoli, R., & Khormaei, F. (2026). Effectiveness of a Creative Problem-Solving Skills Training Package on Self-Efficacy and Personal Growth Initiative in Students. *Journal of Adolescent and Youth Psychological Studies*, 7(5), 1-13.

<http://dx.doi.org/10.61838/kman.jayps.5047>



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ABSTRACT

Objective: The present study was conducted with the aim of examining the effectiveness of a creative problem-solving skills training package on self-efficacy and personal growth initiative among first-cycle secondary school students in the city of Shiraz.

Methods and Materials: This study employed a quasi-experimental design with pre-test, post-test, and one-month follow-up phases, including an experimental group and a control group. The statistical population consisted of female students enrolled in public schools in Shiraz during the 2024–2025 academic year. Using multi-stage cluster sampling, 44 students were randomly assigned to two groups: an experimental group and a control group (22 participants in each group). The research instruments included the Self-Efficacy Questionnaire (Morris, 2001) and the Personal Growth Initiative Scale (Robitschek, 1998). The experimental group received the creative problem-solving skills training package over eight 45-minute sessions, whereas the control group received no intervention. Data were analyzed at the descriptive level (mean and standard deviation) and at the inferential level (mixed repeated-measures analysis of variance) using SPSS version 26.

Findings: The results indicated that the creative problem-solving skills training package had a statistically significant effect on increasing self-efficacy and personal growth initiative ($p < .05$). The one-month follow-up demonstrated that the improvements in self-efficacy and personal growth initiative remained stable in the experimental group, whereas in the control group, no statistically significant differences were observed between the pre-test and follow-up stages for either variable.

Conclusion: The findings of this study suggest that the creative problem-solving skills training package can effectively enhance self-efficacy and personal growth initiative among first-cycle secondary school students. These results have practical implications for educational and counseling programs aimed at promoting students' cognitive, social, and emotional competencies.

Keywords: Creative problem-solving skills training, personal growth initiative, self-efficacy, adolescents.

1. Introduction

Adolescence is a developmentally sensitive period marked by rapid biological maturation, expanding social roles, and increasing academic demands, all of which intensify the need for adaptive self-regulation and effective coping in everyday problem contexts (Koenig et al., 2025). Across early to middle adolescence, students are expected to navigate novel learning tasks, peer dynamics, and identity-relevant choices while maintaining psychological well-being; consequently, competencies that support adaptive functioning—such as self-efficacy, innovation-oriented behavior, and personal growth initiative—have become central targets of contemporary educational and counseling interventions (West et al., 2024; Yıldırım et al., 2025). Recent developmental scholarship underscores that understanding adolescent mental health and competence requires a longitudinal lens, because skill acquisition and psychosocial resources consolidate gradually and can yield cascading effects on later resilience, performance, and well-being (Koenig et al., 2025). Within this framework, creative problem solving can be conceptualized not merely as a cognitive skill set but as a developmentally relevant capacity that integrates cognition, motivation, and emotion regulation, enabling adolescents to interpret challenges as manageable and actionable rather than threatening or overwhelming (Adeoye & Jimoh, 2023; Ghorai & Mohakud, 2025). In parallel, research on adolescent innovation highlights that innovation-oriented tendencies—when supported by a conducive learning ecology—can strengthen academic resilience and sustain performance under demanding conditions, partly through motivational beliefs such as self-efficacy (Qi, 2025). Accordingly, investigating how structured creative problem-solving training may influence adolescents' perceived self-efficacy and proactive growth orientation has clear relevance for school-based mental health promotion and educational effectiveness (Niles et al., 2024; Nurihsan & Habibi, 2024).

Self-efficacy is among the most empirically robust motivational beliefs for explaining how individuals initiate action, persist under difficulty, and rebound after setbacks. From a social cognitive perspective, self-efficacy reflects agentic beliefs about one's capability to organize and execute courses of action, shaping goal selection, effort, persistence, and emotional reactions to stressors (Bandura, 2001). In adolescence, self-efficacy beliefs are particularly consequential because students increasingly shoulder responsibility for learning, interpersonal problem

management, and emotion regulation—domains that map closely onto academic, social, and emotional self-efficacy (Muris, 2001). Empirically, self-efficacy has been linked to academic performance and adjustment, often operating as a mediating mechanism through which resilience and related protective resources translate into achievement outcomes (Supervía et al., 2022). Similarly, adolescent well-being and stress processes appear intertwined with broader psychological capital (e.g., hope, optimism, resilience), with evidence that these assets relate systematically to internalizing/externalizing symptoms and perceived stress in youth (Yıldırım et al., 2025). At the same time, family and psychosocial contexts can shape adolescents' self-evaluations and achievement trajectories; for instance, associations among self-esteem, self-efficacy, loneliness, life satisfaction, and academic achievement have been observed during adolescence, emphasizing the multifactorial nature of competence and well-being (Ercegovac et al., 2021). In educational settings, self-efficacy also functions as a pivotal explanatory construct for learning outcomes and engagement, including pathways through psychological capital and academic self-efficacy (Y. Chen et al., 2023). Beyond academic functioning, self-efficacy is implicated in prosocial and moral action in adolescence; for example, links between adolescents' just-world beliefs and defending behavior in bullying contexts have been explained via self-efficacy and responsibility-related processes (P. L. Chen et al., 2023). These converging lines of evidence position self-efficacy as a plausible mechanism through which skill-based interventions—particularly those that strengthen students' perceived mastery in challenging tasks—may support both performance and psychosocial adjustment (Bandura, 2001; Muris, 2001).

In parallel with self-efficacy research, personal growth initiative (PGI) has gained prominence as a proactive, intentional orientation toward self-change and development. PGI conceptualizes growth not as a passive outcome but as a deliberate set of cognitive-behavioral skills, including readiness for change, planfulness, the use of resources, and intentional action (Robitschek, 1998). Meta-analytic evidence indicates that PGI is meaningfully associated with mental health, supporting the view that intentional growth processes can function as protective or promotive resources across diverse populations (Weigold et al., 2020). More recent syntheses reinforce the relevance of PGI to students' psychological well-being and academic functioning, suggesting that PGI-informed interventions may improve adjustment and flourishing, especially under stress and

uncertainty (Jiao et al., 2024; Nurihsan & Habibi, 2024). Empirical studies further indicate that PGI is associated with adaptive motivational and emotional capacities; for example, meaning in life has been identified as a predictor of PGI and emotional intelligence among adolescents, highlighting PGI's placement within broader developmental systems of purpose, affect regulation, and social functioning (Niles et al., 2024). In higher education contexts, PGI has also been modeled as a protective factor buffering stress and supporting life satisfaction, implying potential relevance for stress-exposed student populations (Stith & Jiang, 2025). Additionally, PGI has been associated with educationally relevant indicators such as instructional quality and engagement, suggesting that growth-oriented learners may evoke or capitalize on more supportive learning interactions (Huang et al., 2023). Intervention studies—such as strengths-based blended learning approaches—have likewise demonstrated that PGI can be increased through structured programming, supporting its malleability and suitability as a training outcome rather than a fixed trait (Green, 2024). Taken together, PGI represents a theoretically grounded and empirically supported target for school-based interventions that aim to enhance adolescents' proactive coping, planning, and resource utilization under academic and social demands (Robitschek, 1998; Weigold et al., 2020).

Creative problem solving (CPS) provides a promising bridge between cognitive skill development and motivational resources like self-efficacy and PGI. Historically, educational research on creativity emphasized divergent thinking and ideational fluency as key components of creative performance, with classic work documenting creativity development across educational stages and arguing for systematic educational practices to cultivate creative behavior (Torrance, 1967). Early CPS traditions also stressed that creativity can be taught through structured processes; foundational perspectives on education and creativity framed creative thinking as a learnable approach to generating and refining ideas, not merely a rare talent (Parnes, 1963). Subsequent empirical research expanded this premise by comparing individual and group efforts in creative problem solving and highlighting how task type and collaboration shape creative outcomes (Brophy, 2006). In mathematics and STEM education, CPS scenario use has been proposed as a practical method to engage learners in exploratory reasoning and real-world application, with educators reporting favorable perceptions of CPS scenarios for learning and problem engagement (Kandemir & Gür,

2009). More broadly, contemporary frameworks position problem-solving skills as essential for 21st-century graduates, closely tied to creativity, innovation, and employability-related competencies (Adeoye & Jimoh, 2023; Bariyyah, 2021). At the empirical level, systematic reviews and research trend analyses suggest growing attention to CPS ability among adolescents, including the diversity of CPS interventions and the need to clarify which program components produce reliable gains in school contexts (Ghorai & Mohakud, 2025). Complementing this, meta-analytic evidence across learning domains indicates that innovative learning approaches can enhance problem-solving outcomes, supporting the rationale for structured CPS-based educational packages (Ridwan et al., 2021; Xu et al., 2023).

Mechanistically, CPS interventions are likely to influence adolescents through both cognitive pathways (e.g., divergent and convergent thinking, strategy repertoire, metacognition) and motivational pathways (e.g., mastery experiences, self-beliefs, persistence). Creativity research increasingly distinguishes divergent thinking (idea generation) and convergent thinking (idea evaluation and selection), showing that both contribute to creative performance in complementary ways (Eon Duval et al., 2023; Wang et al., 2023). Within educational contexts, CPS-based instructional designs—such as flipped learning strategies grounded in creative problem solving—have demonstrated benefits for performing creativity, creative thinking tendencies, and collaboration, suggesting that CPS can be operationalized through pedagogically feasible models in school settings (Hsia et al., 2021). Similarly, inquiry-based STEM activities implemented in out-of-school environments have been found to develop students' CPS skills, emphasizing the value of authentic, exploratory learning conditions for creative competence (Karamustafaoglu & Pektaş, 2023). Classroom-level tools can also support CPS development; for instance, scientific board games have been used to improve creative problem-solving skills, indicating that game-based learning may offer motivating, mastery-rich experiences that strengthen both skill and confidence (Chen et al., 2021). Structured worksheets based on CPS principles have likewise been reported to influence students' problem-solving ability, further supporting the applicability of CPS pedagogy in routine instructional settings (Ichsan et al., 2023). At a broader systems level, meta-analytic evidence suggests that educational robotics can enhance K-12 students' creativity and problem-solving skills, reinforcing that technology-supported, hands-on learning can facilitate

CPS-related competencies when designed appropriately (Zhang & Zhu, 2024). Collectively, these studies support the premise that CPS can be trained through varied modalities and that such training may generalize beyond domain-specific tasks toward wider cognitive-motivational functioning relevant for adolescence (Ghorai & Mohakud, 2025; Ridwan et al., 2021).

Crucially, the link between CPS and adolescents' self-efficacy is theoretically and empirically plausible. From social cognitive theory, repeated mastery experiences and effective strategy use are core sources of efficacy beliefs; thus, CPS training that provides guided practice, feedback, and successful performance opportunities should strengthen perceived capability, especially when tasks are scaffolded to ensure progressive challenge (Bandura, 2001). Empirical evidence from early adolescent samples indicates that reflective processes in the creative workflow can shape outcomes via creative metacognition, self-efficacy, and self-concept, suggesting that structured CPS learning may influence students not only through problem-solving proficiency but also through how they appraise their competence during creative tasks (Anderson & Haney, 2021). In higher education, academic self-efficacy has been identified as part of the mechanism linking psychological capital to learning outcomes, highlighting that motivational resources and efficacy beliefs can mediate the translation of positive psychological assets into performance (Y. Chen et al., 2023). In applied counseling and educational research, self-efficacy has also been incorporated into models of maladaptive academic behaviors such as procrastination, suggesting that strengthening efficacy beliefs may have downstream benefits for self-regulatory functioning (Kamyabi et al., 2024). Moreover, problem-solving and related skills training have been shown to improve psychosocial outcomes such as self-esteem and mental health among female adolescents, indicating that competence-focused interventions may yield broader well-being benefits beyond the targeted skill domain (Golshiri et al., 2023). In professional and adult samples, problem-solving skills have been examined alongside positive psychological capital, further supporting the conceptual alignment between problem-solving competence and agentic motivational resources (Yildiz & Topayli, 2024). Given that adolescence is also a period of heightened digital exposure and social comparison pressures, strengthening internal resources such as self-efficacy may be particularly important; scoping evidence grounded in self-determination theory indicates that adolescent social media use intersects

with autonomy, competence, and relatedness dynamics, making competence-supporting interventions relevant for healthy development in contemporary contexts (West et al., 2024).

Similarly, CPS training may plausibly foster PGI by strengthening planning, intentional action, and resource utilization—skills explicitly embedded in the PGI construct (Robitschek, 1998). PGI research suggests that growth-oriented action is supported when individuals can translate intentions into structured plans and when they believe they can mobilize resources effectively; CPS packages often teach structured steps (problem identification, idea generation, idea evaluation, solution planning, implementation) that align directly with these PGI components (Phaksunchai et al., 2014; Robitschek, 1998). Meta-analytic and systematic review evidence indicates that PGI relates meaningfully to psychological well-being and can be enhanced through targeted interventions, supporting its suitability as an outcome of skills-based educational packages (Nurihsan & Habibi, 2024; Weigold et al., 2020). Additionally, PGI has been studied in relation to educational quality indicators and engagement, suggesting that promoting PGI may contribute to improved classroom functioning and perceived quality via students' proactive involvement and sustained developmental striving (Bai et al., 2024; Huang et al., 2023). A meta-analysis of correlates of PGI among college students provides further support for the breadth of factors associated with PGI, implying that interventions can be designed to target modifiable antecedents such as motivational beliefs, cognitive strategies, and engagement behaviors (Jiao et al., 2024). Moreover, in applied health-related contexts, problem-solving interventions have been evaluated for families caring for children and adolescent cancer survivors, underscoring the general utility of problem-solving as a coping and adaptation resource in challenging life circumstances—conditions in which PGI-oriented action may also be critical (Prates et al., 2024). Taken together, PGI appears to be a meaningful developmental asset that could be strengthened by structured CPS training, particularly when such training emphasizes intentional planning, persistence, and leveraging social/educational supports (Green, 2024; Stith & Jiang, 2025).

Despite the expanding literature on CPS interventions and the robust evidence base on self-efficacy and PGI, important gaps remain. First, research trend reviews note heterogeneity in CPS operationalization and outcomes, indicating the need for well-specified training packages with clear session

structures and theoretically consistent targets—especially for school-going adolescents (Ghorai & Mohakud, 2025). Second, although creativity development research highlights dynamic changes across school years, fewer intervention studies explicitly examine whether gains persist beyond immediate post-test assessments, even though developmental perspectives emphasize the importance of stability and longitudinal trajectories during adolescence (Eon Duval et al., 2023; Koenig et al., 2025). Third, while diverse instructional modalities (e.g., flipped CPS learning, robotics, games, inquiry-based STEM) show promise, their mechanisms may vary and their generalizability to broader psychosocial outcomes (such as PGI and multi-domain self-efficacy) requires further empirical verification in specific educational-cultural contexts (Chen et al., 2021; Hsia et al., 2021; Zhang & Zhu, 2024). Finally, self-efficacy research suggests that domain-specific efficacy (academic/social/emotional) may respond differently to interventions depending on the content and social structure of training, warranting multidimensional assessment rather than reliance on single global indicators (Ercegovac et al., 2021; Muris, 2001). Addressing these gaps is particularly valuable for early secondary school students, who often experience the transition to more complex academic expectations and more salient peer and identity challenges, thereby increasing the practical importance of interventions that strengthen competence beliefs and proactive growth skills (Bandura, 2001; Niles et al., 2024).

Accordingly, this study aimed to examine the effectiveness of a creative problem-solving skills training package on self-efficacy and personal growth initiative among female first-cycle secondary school students.

2. Methods and Materials

2.1. Study Design and Participants

The present study was applied in terms of purpose and employed a quasi-experimental design with pre-test, post-test, and a one-month follow-up phase, including an experimental group and a control group. The statistical population consisted of female first-cycle secondary school students enrolled in public schools in the city of Shiraz during the 2024–2025 academic year. Sampling was conducted using a multi-stage random cluster sampling method. Initially, two districts were randomly selected from among the four educational districts of Shiraz. Subsequently, one female first-cycle secondary school was randomly selected from each district, and from each school, one intact

classroom (as the final cluster) was selected through a lottery method. Finally, the two selected classes (one from each district) were randomly assigned to the experimental group and the control group, respectively. The number of eligible and present students in each class was approximately 22, resulting in a total sample of 44 students (22 in the experimental group and 22 in the control group) who participated in the study.

To implement the study, official permission was first obtained from the Department of Education. After securing informed consent from the students, the research process was initiated.

All ethical considerations were strictly observed, including adherence to scientific integrity, obtaining informed consent for participation, ensuring confidentiality of information, and maintaining participants' anonymity. Participants' identities were protected throughout all stages of the study, and they were informed of their right to withdraw from the research at any time without any negative consequences.

Inclusion criteria comprised being female, being within the age range of 15 to 16 years, not having any diagnosed psychological disorders (based on self-report and school records), and not having participated in similar training programs during the past year. Exclusion criteria included being more than 30 minutes late for three sessions, absence from more than one session, and failure to complete the assignments provided during the training sessions.

2.2. Measures

The Personal Growth Initiative Scale was developed by Robitschek (1998) and consists of 16 items categorized into four subscales: Readiness for Change (items 2, 8, 11, 16), Planfulness (items 1, 3, 5, 10, 13), Using Resources (items 6, 12, 14), and Intentional Behavior (items 4, 7, 9, 15). This instrument is a self-report paper-and-pencil questionnaire. Responses are rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree), with total scores ranging from 16 to 64. Higher scores indicate higher levels of personal growth initiative, willingness to change, deliberate planning, effective use of resources, and intentional behavior in the pursuit of personal development. Lower scores reflect lower levels of personal growth initiative and reduced motivation for change and resource utilization. Robitschek (1998) examined the psychometric properties of the Personal Growth Initiative Scale in the original study. The results demonstrated satisfactory

reliability, with Cronbach's alpha coefficients reported as .82 for Readiness for Change, .80 for Planfulness, .78 for Using Resources, .80 for Intentional Behavior, and .89 for the total scale. Construct validity was examined using exploratory factor analysis, which supported a four-factor structure. In Iran, the validity of the Personal Growth Initiative Scale was confirmed by Bai et al. (2024) through confirmatory factor analysis, with factor loadings exceeding .70, and reliability coefficients of .79, .82, .78, .80, and .83 for Readiness for Change, Planfulness, Using Resources, Intentional Behavior, and the total scale, respectively. In the present study, confirmatory factor analysis supported the four-factor structure (Readiness for Change, Planfulness, Using Resources, and Intentional Behavior). Factor loadings ranged from .48 to .73 for Readiness for Change, .47 to .60 for Planfulness, .38 to .72 for Using Resources, and .60 to .74 for Intentional Behavior. Model fit indices were evaluated according to Kline (2011) and were found to be satisfactory ($\chi^2/df = 2.14$, AGFI = .91, GFI = .90, IFI = .91, CFI = .89, RMSEA = .05, PCLOSE = .12). Reliability was assessed using Cronbach's alpha, yielding coefficients of .78, .82, .80, .79, and .81 for the respective subscales and the total scale, indicating adequate internal consistency.

The Self-Efficacy Questionnaire was developed by Muris (2001) and assesses individuals' self-efficacy across three domains: academic, social, and emotional. The instrument consists of 24 items organized into three subscales: Academic Self-Efficacy (items 1–8), Social Self-Efficacy (items 9–16), and Emotional Self-Efficacy (items 17–24). Responses are rated on a 4-point Likert scale ranging from 1 (very low) to 4 (very high). Total scores range from 24 to 96, with higher scores indicating higher levels of self-efficacy across the three domains and lower scores indicating lower perceived self-efficacy. Muris (2001) evaluated the validity of the questionnaire using principal component factor analysis with orthogonal rotation. The results showed that correlations between the subscales and the total score were .30 for the academic dimension, .60 for the social dimension, and .47 for the emotional dimension, all indicating satisfactory construct validity. Reliability analysis yielded a Cronbach's alpha coefficient of .88 for the total scale, and .85, .88, and .86 for the academic, social, and emotional subscales, respectively, indicating good internal consistency. In Iran, Kamyabi et al. (2024) reported Cronbach's alpha coefficients of .86 for the academic dimension, .75 for the social dimension, .81 for the emotional dimension, and .85 for the total scale, and confirmed construct validity using confirmatory factor

analysis. In the present study, confirmatory factor analysis supported the three-factor structure (academic, social, emotional). Factor loadings ranged from .38 to .73 for the academic dimension, .48 to .67 for the social dimension, and .39 to .71 for the emotional dimension. Item 1 was removed due to a factor loading below .30 and was not included in the final analysis. Model fit indices, evaluated based on Kline (2011), indicated good fit ($\chi^2/df = 1.64$, AGFI = .90, GFI = .95, IFI = .92, CFI = .91, RMSEA = .04, PCLOSE = .09). Reliability analysis using Cronbach's alpha showed coefficients of .78 for the academic dimension, .72 for the social dimension, .80 for the emotional dimension, and .81 for the total scale, indicating acceptable reliability.

2.3. Intervention

The creative problem-solving (CPS) training package was developed based on the standardized Osborne–Parnes Creative Problem Solving model, encompassing six sequential stages (objective finding, fact finding, problem finding, idea finding, solution finding, and acceptance finding), and was systematically designed through the ADDIE instructional design framework (analysis, design, development, implementation, and evaluation). In the analysis phase, a comprehensive needs assessment was conducted using a researcher-developed 44-item Likert-scale questionnaire administered to 420 undergraduate students, and Borich's needs assessment model (weighted discrepancy scores between perceived importance and current performance) revealed that the highest instructional needs were concentrated in problem identification, idea generation, and fact finding, whereas acceptance finding demonstrated the lowest priority; these findings guided the prioritization of session content. During the design phase, relevant national and international literature and educational documents were reviewed, and the overall structure of the package—including behavioral objectives, stage-specific content, structured activities, guided exercises, and assessment tools—was organized in alignment with both the Osborne–Parnes model and empirically derived training priorities. In the development phase, comprehensive instructional materials were produced, including a facilitator's manual, participant workbooks, structured activity cards, authentic problem-based scenarios, and creativity enhancement tools such as brainstorming, SCAMPER, and the Osborne checklist; a six-step thematic analysis procedure (data familiarization, code extraction, theme formulation, network mapping, stage labeling, and

reporting) was applied to refine and finalize the instructional content, resulting in an eight-session group-based protocol (each session lasting 45 minutes) designed to progressively strengthen divergent thinking during idea finding and convergent thinking during solution evaluation and acceptance stages. The implementation phase included a pilot administration with 30 students to identify logistical issues such as time allocation and activity engagement, after which necessary modifications were made before delivering the finalized protocol to the experimental group in the main study. In the evaluation phase, content validity was assessed by 16 higher education experts using a five-point scale, yielding a Content Validity Index (CVI = 0.91) and Content Validity Ratio (CVR = 0.84), indicating excellent content validity; theoretical validity was examined through pattern-matching analysis by aligning the six thematically derived stages with the Osborne–Parnes framework, and independent ratings by two instructional design experts and two creativity specialists demonstrated a mean stage alignment exceeding 0.95 (on a 0–1 scale), confirming strong structural congruence. The finalized protocol comprised eight structured sessions: Session 1 introduced CPS concepts, differences from traditional problem solving, and principles of divergent and convergent thinking; Session 2 focused on objective finding through goal clarification and

challenge identification; Session 3 emphasized systematic information gathering and fact analysis; Session 4 trained participants in authentic problem identification and prioritization; Session 5 concentrated on divergent ideation using brainstorming and creative techniques; Session 6 developed convergent evaluation skills for comparing and selecting optimal solutions; Session 7 addressed acceptance finding, change management, and implementation planning; and Session 8 provided comprehensive review, group discussion, skill evaluation, and feedback, thereby ensuring that all standard stages of instructional design—from needs assessment to outcome evaluation—were rigorously and systematically implemented within the intervention protocol.

2.4. Data Analysis

Data analysis was conducted using SPSS version 26 at both descriptive and inferential levels through analysis of variance procedures. The findings are presented accordingly.

3. Findings and Results

Descriptive findings for the demographic variables are presented in Table 1.

Table 1

Mean and Standard Deviation of Demographic Variables in the Two Groups

Variable	Experimental Group (Mean ± SD)	Control Group (Mean ± SD)	t	p-value
Age (years)	15.6 ± 0.45	15.7 ± 0.42	-0.76	.451
Grade Point Average	16.84 ± 1.52	16.79 ± 1.63	0.11	.923

The descriptive results in Table 1 indicate that the mean and standard deviation of the demographic variables (age and grade point average) did not differ significantly between the experimental and control groups. This finding suggests that the groups were comparable in terms of baseline characteristics, allowing the effect of the educational intervention to be examined independently. Table 3 presents

the means and standard deviations of self-efficacy (including academic, social, and emotional components) and personal growth initiative (including readiness for change, planfulness, using resources, and intentional behavior) across the experimental and control groups at the three measurement stages: pre-test, post-test, and one-month follow-up.

Table 2

Mean and Standard Deviation of Study Variables Across Groups and Measurement Phases

Variable	Component	Group	Pre-test Mean	Pre-test SD	Post-test Mean	Post-test SD	Follow-up Mean	Follow-up SD
Self-Efficacy	Academic	Experimental	21.18	2.83	25.09	2.63	25.18	2.38
		Control	19.68	2.76	19.31	3.35	19.13	3.10
	Social	Experimental	20.59	3.77	23.86	3.38	23.90	3.11
		Control	20.22	2.63	20.32	2.28	20.50	2.48

Personal Growth Initiative	Emotional Readiness for Change	Experimental	19.27	2.18	24.95	2.60	24.68	2.62
		Control	22.72	2.79	22.50	3.17	22.95	2.76
	Planfulness	Experimental	8.68	2.43	15.90	2.44	15.95	2.21
		Control	13.18	2.10	13.36	1.98	13.54	1.92
	Using Resources	Experimental	12.01	1.85	16.13	2.12	16.04	2.17
		Control	15.90	1.60	15.77	2.15	15.45	2.06
	Intentional Behavior	Experimental	6.86	1.20	10.95	1.61	11.18	1.68
		Control	9.45	1.37	9.36	1.52	9.77	1.79
	Experimental	10.36	1.59	13.86	1.75	13.80	1.45	
		Control	12.59	1.91	12.63	2.34	12.64	2.01

As shown in Table 2, in the experimental group, the mean scores of all components of self-efficacy and personal growth initiative increased consistently from pre-test to post-test and remained elevated at the one-month follow-up. In contrast, in the control group, the means remained relatively stable across the three measurement phases without substantial change. This preliminary descriptive pattern suggests a potential effect of the intervention on the experimental group. To examine the effectiveness of the creative problem-solving skills training package on self-efficacy and personal growth initiative, a mixed-design analysis of variance (mixed ANOVA) was conducted. Given the research design (two independent groups: experimental and control; and three within-group measurement phases: pre-test, post-test, and one-month follow-up), this method allowed assessment of the main effects of group and time, as well as the group \times time interaction. Prior to conducting the analysis, assumptions of normality, homogeneity of variances, and equality of covariance matrices were examined.

The results indicated that based on the Kolmogorov-Smirnov test, p-values for all variables across measurement phases exceeded .05, and skewness and kurtosis values were within ± 1.96 , supporting the assumption of normality. Additionally, Box's M test demonstrated homogeneity of

covariance matrices for self-efficacy (Box's M = 0.11, $p = .92$) and personal growth initiative (Box's M = 0.11, $p = .92$). Levene's test confirmed equality of variances for self-efficacy at pre-test ($F = 0.002$, $p = .963$), post-test ($F = 0.793$, $p = .378$), and follow-up ($F = 1.332$, $p = .255$), as well as for personal growth initiative at pre-test ($F = 0.121$, $p = .729$), post-test ($F = 0.409$, $p = .526$), and follow-up ($F = 0.215$, $p = .645$). Therefore, the homogeneity assumptions were satisfied and the conditions for conducting mixed ANOVA were met. Wilks' Lambda indicated that the main effect of time on self-efficacy and personal growth initiative was significant at $p < .001$. Furthermore, the time \times group interaction effect was significant at $p < .001$ for both variables. The significant interaction effect indicates that the pattern of change in self-efficacy and personal growth initiative scores differed between the experimental and control groups across the three measurement phases. This finding demonstrates that the creative problem-solving skills training package significantly increased and sustained both constructs in the experimental group. The large partial eta squared values (greater than .80 for both variables) indicate a very strong intervention effect. To further examine between-group differences while controlling for pre-test scores, analysis of covariance results are presented below:

Table 3

Between-Group Analysis of Variance Results

Variable	Source of Effect	Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Self-Efficacy	Time \times Group	897.284	1	897.284	143.478	< .001	.774
	Group	1645.121	1	1645.121	13.804	< .001	.247
Personal Growth Initiative	Time \times Group	1957.102	1	1957.102	168.966	< .001	.801
	Group	122.735	1	122.735	10.432	< .001	.303

As shown in Table 3, the main effect of group on self-efficacy was significant ($F = 13.804$, $p < .001$). The time \times group interaction for self-efficacy was also significant ($F = 143.478$, $p < .001$), indicating the impact of the educational

package on changes in self-efficacy over time. For personal growth initiative, both the main effect of group ($F = 10.432$, $p < .001$) and the time \times group interaction ($F = 168.966$, $p < .001$) were significant, reflecting the positive effect of the

intervention and differential change patterns across groups over time. Bonferroni post hoc comparisons are presented in Table 4.

Table 4

Bonferroni Post Hoc Test Results for Mean Comparisons of Study Variables

Variable	Time 1	Time 2	Mean Difference	Standard Error	p
Self-Efficacy	Pre-test	Post-test	-6.273	1.106	< .001
	Pre-test	Follow-up	-6.341	1.107	< .001
	Post-test	Follow-up	-0.068	0.253	.789
Personal Growth Initiative	Pre-test	Post-test	-9.477	1.574	< .001
	Pre-test	Follow-up	-9.705	1.607	< .001
	Post-test	Follow-up	0.227	0.603	.708

Examination of the Bonferroni test results in Table 4 indicates that the mean self-efficacy scores at post-test and follow-up were significantly higher than at pre-test ($p < .001$). However, the difference between post-test and follow-up was not significant ($p = .789$), indicating stability of the intervention effect over time. Similarly, for personal growth initiative, mean scores at post-test and follow-up were significantly higher than at pre-test ($p < .001$), whereas the difference between post-test and follow-up was not significant ($p = .708$), suggesting that the effect of the educational package on this skill was maintained at the one-month follow-up.

4. Discussion

The present study examined the effectiveness of a creative problem-solving (CPS) skills training package on self-efficacy and personal growth initiative (PGI) among female first-cycle secondary school students. The results of mixed-design ANOVA demonstrated significant main effects of time and significant time \times group interaction effects for both self-efficacy and PGI. Specifically, students in the experimental group showed substantial increases in academic, social, and emotional self-efficacy, as well as in all components of PGI (readiness for change, planfulness, using resources, and intentional behavior) from pre-test to post-test, and these gains were maintained at the one-month follow-up. In contrast, the control group exhibited no statistically meaningful changes across measurement phases. The large partial eta squared values indicated a strong intervention effect, suggesting that the CPS training package produced not only statistically significant but also practically meaningful improvements in both constructs.

The observed increase in self-efficacy aligns closely with social cognitive theory, which posits that mastery

experiences are the most influential source of efficacy beliefs (Bandura, 2001). The CPS training sessions provided structured opportunities for students to define problems, generate alternative solutions, evaluate options, and implement action plans, thereby enabling repeated experiences of guided success. Such experiences likely enhanced students' perceptions of competence in handling academic and social challenges. The multidimensional improvement across academic, social, and emotional self-efficacy is consistent with the conceptualization of youth self-efficacy as a domain-specific yet interrelated construct (Muris, 2001). Furthermore, prior research indicates that self-efficacy mediates the relationship between resilience and academic performance in adolescence (Supervía et al., 2022), suggesting that strengthening efficacy beliefs through CPS training may have broader implications for students' long-term academic adaptation.

The present findings also correspond with studies linking self-efficacy to psychological capital and well-being. Adolescents' psychological capital has been associated with lower internalizing and externalizing symptoms and better well-being (Yıldırım et al., 2025), and CPS training may indirectly reinforce components of psychological capital by fostering agency, optimism, and adaptive coping. Similarly, evidence shows that academic self-efficacy mediates the impact of psychological capital on learning outcomes (Y. Chen et al., 2023), reinforcing the idea that interventions enhancing perceived competence can translate into improved educational functioning. The maintenance of self-efficacy gains at follow-up further supports the durability of skill-based mastery experiences, particularly when they involve active participation and reflection. Research on reflective processes in creative tasks indicates that creative metacognition and self-efficacy are intertwined (Anderson & Haney, 2021); thus, the reflective components embedded

in CPS training may have consolidated students' internal competence appraisals.

The results regarding personal growth initiative are equally noteworthy. PGI, conceptualized as intentional engagement in self-change processes (Robitschek, 1998), significantly increased across all subcomponents in the experimental group. This suggests that CPS training not only improved students' immediate problem-solving ability but also enhanced their proactive orientation toward growth and change. Such findings are congruent with meta-analytic evidence showing that PGI is associated with mental health and adaptive functioning (Weigold et al., 2020). The CPS package's emphasis on structured planning and resource use likely strengthened students' planfulness and use-of-resources skills, while collaborative exercises may have reinforced intentional behavior and readiness for change.

Systematic reviews underscore the importance of PGI for students' psychological well-being (Nurihsan & Habibi, 2024), and meta-analytic findings highlight multiple correlates of PGI in academic populations (Jiao et al., 2024). Moreover, research demonstrates that meaning in life predicts PGI and emotional intelligence in adolescents (Niles et al., 2024). CPS training, by encouraging students to actively interpret challenges as opportunities for improvement, may contribute to a sense of purpose and growth orientation, thereby reinforcing PGI processes. Intervention research further supports the malleability of PGI; for example, strengths-based blended learning approaches have been shown to enhance PGI among university students (Green, 2024). The present findings extend this evidence to early adolescents in secondary school contexts, suggesting that PGI is trainable even during early developmental stages.

The strong interaction effects observed in this study parallel findings from research on CPS-based educational strategies. Meta-analytic evidence indicates that innovative instructional approaches enhance problem-solving ability (Ridwan et al., 2021; Xu et al., 2023). Inquiry-based STEM activities and flipped learning models grounded in CPS principles have been shown to improve creative thinking, collaboration, and performance creativity (Hsia et al., 2021; Karamustafaoğlu & Pektaş, 2023). Similarly, educational robotics interventions positively affect creativity and problem-solving skills in K-12 students (Zhang & Zhu, 2024). These findings collectively support the theoretical expectation that structured CPS training should influence not only cognitive performance but also motivational constructs such as self-efficacy and PGI. The alignment between the

present findings and research using scientific board games or CPS-based worksheets further underscores that diverse CPS modalities can yield measurable improvements in student outcomes (Chen et al., 2021; Ichsan et al., 2023).

From a developmental perspective, adolescence represents a critical period for cultivating innovation and resilience. Innovation tendencies have been linked to academic resilience and distance learning self-efficacy (Qi, 2025). By strengthening CPS skills, the training package may have enhanced students' capacity to adapt creatively to academic challenges, reinforcing their academic resilience. In addition, studies show that problem-solving skills are essential competencies for 21st-century learners (Adeoye & Jimoh, 2023; Bariyyah, 2021). The present findings support the argument that CPS training constitutes a viable pathway for equipping adolescents with adaptive competencies relevant to contemporary educational demands.

The improvement in PGI also aligns with findings that PGI functions as a protective factor against stress and supports life satisfaction (Stith & Jiang, 2025). Moreover, PGI has been associated with teacher engagement and instructional quality (Bai et al., 2024; Huang et al., 2023), suggesting potential systemic benefits if CPS programs are integrated into school curricula. Given evidence linking self-efficacy to psychosocial outcomes such as bullying defending behavior (P. L. Chen et al., 2023) and associations among self-efficacy, self-esteem, and academic achievement (Ercegovac et al., 2021), enhancing self-efficacy through CPS training may indirectly influence social behavior and emotional adjustment.

Historically, creativity education has emphasized the importance of teaching divergent and convergent thinking processes (Torrance, 1967; Wang et al., 2023). Foundational work on creativity in education argued that structured instruction can cultivate creative behavior (Parnes, 1963). Research comparing individual and group creative efforts further demonstrates that collaborative problem solving can yield beneficial outcomes (Brophy, 2006). The CPS package implemented in this study integrated collaborative elements, which may have amplified social learning processes consistent with social cognitive principles (Bandura, 2001). In contemporary contexts characterized by digital engagement and social media influences, interventions that reinforce competence and autonomy may be especially important for adolescents' healthy development (West et al., 2024).

5. Conclusion

Finally, systematic reviews highlight increasing scholarly attention to CPS among school-going adolescents (Ghorai & Mohakud, 2025), and the present study contributes empirical evidence supporting CPS training as an effective educational and psychological intervention.

6. Limitations & Suggestions

Several limitations should be acknowledged. First, the sample consisted exclusively of female students from public schools in a single city, which limits generalizability to male students or other sociocultural contexts. Second, the reliance on self-report instruments may have introduced response bias, particularly social desirability effects. Third, although the one-month follow-up demonstrated stability of effects, longer-term follow-ups are necessary to determine whether gains persist across academic years. Finally, the quasi-experimental design, while robust, does not allow for full randomization at the individual level, and unmeasured contextual factors may have influenced outcomes.

Future studies should replicate the intervention with more diverse samples, including male students and students from different educational systems. Longitudinal designs extending beyond one month would clarify the durability of CPS training effects. Researchers may also explore potential mediators, such as creative metacognition or resilience, and moderators, such as baseline academic performance or socioeconomic status. Comparative studies examining different CPS instructional modalities could further identify the most effective components of training packages. Additionally, mixed-methods approaches incorporating qualitative data may provide deeper insight into students' subjective experiences of growth and competence development.

Educational policymakers and school counselors are encouraged to integrate structured CPS training programs into middle school curricula as part of social-emotional learning initiatives. Teachers may incorporate collaborative problem-solving tasks, reflective exercises, and structured planning components to reinforce both cognitive and motivational development. School psychologists can employ CPS-based group interventions to support students with low self-efficacy or limited growth orientation. Professional development programs for educators should emphasize strategies for fostering mastery experiences and constructive feedback to enhance students' sense of agency. By embedding CPS training within regular classroom

practice, schools can cultivate proactive, resilient, and growth-oriented learners prepared to navigate academic and social challenges effectively.

Acknowledgments

We would like to express our appreciation and gratitude to all those who cooperated in carrying out this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. This study was approved by the Ethics Committee of the Faculty of Education and Psychology at Shiraz University (Ethics Code: IR.US.PSYEDU.REC.1404.072).

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

Authors' Contributions

All authors equally contributed to this article.

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