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Comparison the Effectiveness of Self-Regulation Training, Academic Help-Seeking Training and Problem-Solving Training on Academic Enthusiasm

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ABSTRACT

Objective: The present study aimed to compare the effectiveness of self-regulation training, academic help-seeking training, and problem-solving training on the academic enthusiasm of male high school students in Bandar Abbas.

Methods: This applied study employed a quasi-experimental pretest–posttest design with a control group. The statistical population consisted of all male high school students in Bandar Abbas during the 2023–2024 academic year. Using convenience sampling, 60 students were selected and randomly assigned to three experimental groups (self-regulation training, academic help-seeking training, and problem-solving training) and one control group (15 participants per group). Academic enthusiasm was measured using the Vega Academic Enthusiasm Scale (2016). The experimental groups received 12 training sessions over one month, while no intervention was provided to the control group. Data were analyzed using SPSS version 27, employing multivariate analysis of covariance (MANCOVA) and Bonferroni post hoc tests.

Results: The results indicated that self-regulation training and problem-solving training led to a significant increase in academic enthusiasm compared with the control group ($P < 0.05$). In contrast, academic help-seeking training did not produce a significant effect on academic enthusiasm. Furthermore, no significant difference was observed between the effects of self-regulation training and problem-solving training on academic enthusiasm.

Conclusions: The findings suggest that self-regulation and problem-solving training are effective interventions for enhancing academic enthusiasm among male high school students, whereas academic help-seeking training alone may be insufficient. These results highlight the importance of incorporating self-management and cognitive-behavioral skills into educational interventions.

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Introduction

One of the most critical deficiencies that profoundly affects the educational environment is academic enthusiasm. Academic enthusiasm leads to students' academic orientation, supports a positive and goal-directed learning process rather than merely attempting to eliminate existing problems in the educational process, and contributes to students' academic development and mental health. Academic enthusiasm refers to the quantity and quality of students' physical and psychological energy that they invest throughout their academic life (Zhang et al., 2019). This concept reflects the quality of effort that students devote to purposeful educational activities in order to play a direct role in achieving desirable outcomes (Chang et al., 2016). Given that academic enthusiasm is considered one of the strongest predictors of academic success (Darabi et al., 2022), the absence of this construct in the lower secondary school educational context creates a fundamental and irreparable challenge. Therefore, it is essential to employ effective intervention strategies to enhance academic enthusiasm among lower secondary school students.

Recent studies (Boschov et al., 2023; Núñez et al., 2022; Sáiz-Manzanares et al., 2022; Sinering et al., 2022; De la Fuente et al., 2022) indicate that self-regulation training has significant effects on a wide range of positive and negative constructs in educational psychology. These effects have been favorably reflected in improving the educational climate of lower secondary schools (Darabi et al., 2022). Self-regulated learning enhances individuals' capacity to regulate their behavior in response to internal and external environmental conditions and changes (Chitra et al., 2022). Cognitive and behavioral self-regulation constitutes a crucial aspect of students' learning and academic performance in classroom settings. Self-regulation theories generally explain why and how students engage in learning, as well as what they need to know about themselves and their academic tasks in order to learn independently. In other words, these theories explain how students guide their own learning and how the selection of cognitive, metacognitive, and behavioral strategies increases their academic effort (Jalilzadeh & Zarei, 2018).

Self-regulated learning is defined as "self-generated thoughts, emotions, and actions that are planned and cyclically adapted to the attainment of personal goals." Self-regulated learning can be organized into three phases: (1) forethought, (2) performance, and (3) self-reflection. During the forethought phase, students engage in task analysis (i.e., goal setting and strategic planning) and motivational beliefs (such as self-efficacy, outcome expectations, intrinsic interest/value, and goal

orientation) to activate learning. In the performance phase, learners execute tasks and engage in self-control processes to monitor their learning progress (e.g., self-instruction, imagery, attentional focusing, and task strategies), as well as self-observation processes to remain engaged in learning activities (Reparaz, 2020).

Based on existing research in educational psychology, academic help-seeking training appears to exert positive effects on adaptive psychological constructs while reducing maladaptive ones. According to Butler (2013), academic help-seeking is an active effort to utilize available resources in order to achieve success. In the help-seeking process, learners must first recognize that a task is difficult and that they are unable to complete it independently, thereby acknowledging the need for assistance. Subsequently, learners evaluate all available information and decide whether or not to seek help. Therefore, appropriate training in help-seeking strategies contributes to enhancing positive psychological constructs (Nuhpour et al., 2020). When students receive help-seeking training, they are more likely to seek assistance from teachers or knowledgeable peers to improve their academic performance. Help-seeking enables students not only to resolve academic difficulties but also to actively participate in classroom activities, thereby increasing their motivation to learn (Newman, 2023). Accordingly, academic help-seeking training is considered a potentially effective intervention for addressing the educational challenges examined in the present study.

There is a broad consensus among educational psychology researchers that a lack of academic enthusiasm prevents students from achieving optimal growth and development within educational settings (Zhang et al., 2019; Martin et al., 2023; Baytemir, 2023; Smith, 2023). At the same time, the problem-solving process seeks to eliminate students' emotional and cognitive barriers. Thus, it appears that implementing problem-solving training can yield favorable outcomes in the target variables. Researchers have emphasized that problem-solving is a critical concern within the educational systems of all countries (Azimpour et al., 2021). Successful adaptation and effective coping with social and educational environments require a set of interpersonal problem-solving skills (Río et al., 2020). Problem-solving skills represent a cognitive–behavioral process through which individuals identify and apply effective strategies for coping with problematic life situations (Povisa et al., 2020). In other words, problem-solving is an essential coping strategy that enhances

personal and social functioning while reducing stress and psychological problems (Kim et al., 2019).

Considering the observed challenges and problems among lower secondary school students, and given the researcher's aim to identify the most effective method for enhancing academic enthusiasm, the present study sought to clearly and systematically compare the effectiveness of self-regulation training, academic help-seeking training, and problem-solving training on academic enthusiasm among male lower secondary school students in Bandar Abbas.

Material and Methods

The present study was applied in purpose and employed a quasi-experimental design with a pretest–posttest control group for data collection. The statistical population consisted of all male lower secondary school students enrolled in schools in Bandar Abbas during the 2022–2023 academic year. A convenience sampling method was used. To select the sample, one boy's lower secondary school in Bandar Abbas was invited to participate in the study. Based on previous research, the sample size was determined as 15 students per group. Given the inclusion of four groups (three experimental groups and one control group), the total sample size comprised 60 students.

Self-Regulation Training Intervention

To implement the independent variable of self-regulation training, 12 sessions of 90 minutes each were conducted. The intervention sessions were based on the protocol developed by Pintrich and De Groot (1990), as described below. Because the original 15-session protocol of Pintrich and De Groot (1990) was condensed into 12 sessions, the content validity of the modified sessions was reassessed and confirmed using Lawshe's method.

Table 1. Description of Self-Regulation Training Sessions

Session	Description
1	Introduction to self-regulated learning as a type of learning involving goal setting, effort regulation, self-monitoring, time management, and regulation of the physical and social learning environment.
2	Explanation of cognition as a mental process that processes information, enabling students to attend to, recognize, encode, and store information in memory.
3	Emphasis on this strategy as a method for retaining information, whereby students attempt to link new content to their prior knowledge.
4	Explanation of the organization strategy as an effective approach for learning complex material through categorizing content based on similarities and differences.
5	Explanation of metacognition and planning strategies, including coordinating learning resources with time and determining the sequence, timing, and quality of academic tasks.

6	Practical explanation of control and monitoring strategies to help students become aware of their progress, supervision, guidance, and evaluation of their learning.
7	Emphasis on coordination between regulation strategies and monitoring strategies; explanation of key regulation strategies such as adjusting study pace and revising or changing cognitive strategies.
8	Explanation of time management as a means for students to adapt to and modify their environment to meet their goals and needs.
9	Instruction on selecting an appropriate learning environment in terms of physical conditions, distraction control, facilities, and supportive individuals; training in resource management strategies affecting self-regulated learning, help-seeking, and effort regulation; instruction on how to ask questions and seek help from appropriate individuals in socially appropriate ways.
10	Explanation of motivation and self-efficacy beliefs and how these beliefs influence students' activities, particularly academic activities.
11	Explanation of goal orientation, its role in self-regulated learning, and the characteristics of precise, appropriate, and attainable goals.
12	Explanation of academic delay of gratification, its role in self-regulated learning, and its importance for students.

Academic Help-Seeking Training Intervention

To implement the independent variable of academic help-seeking training, 12 sessions of 90 minutes were conducted. The intervention was based on the protocol proposed by Hashemi et al. (2017).

Table 2. Description of Academic Help-Seeking Training Sessions

Session	Description
1	Presentation of help-seeking strategies and their role and importance in facilitating effective learning.
2	Training on appropriate timing for help-seeking and how to express requests for help.
3	Training on identifying knowledgeable teachers and peers, as well as when and how to approach them.
4	Mental rehearsal practice for identifying and analyzing problems through planning a short research trip as a group leader.
5	Training on academic and social goals, self-belief, and emotions that help students tolerate difficulties, along with strengthening self-reinforcement to avoid negative perceptions.
6	Training in effective explanations combined with activities to enhance general communication skills.
7	Training in using scientific explanations during collaborative problem-solving.
8	Training in asking higher-order questions and designing strategic questions, particularly in planning problem-solving processes.
9	Pairing students to explain content requiring clarification; training in reading and summarizing by one student and identifying errors by the other.
10	Training in problem-solving and articulating reasoning using metacognitive cues.
11	Training in working independently, receiving hints, and requesting partial guidance.
12	Presentation of materials on the importance of providing help, practice exercises, and practical implementation of session content.

Problem-Solving Training Intervention

To implement the independent variable of problem-solving training**,** 12 sessions of 90 minutes were conducted. The intervention followed the protocol developed by D'Zurilla and Goldfried (1971).

Table 3. Description of Problem-Solving Training Sessions

Session	Description
1	Definition of problem-solving skills; group participation rules; importance of problem-solving skills in daily life; review of coping styles; assessment of group members' interests and concerns.
2	Review of previous assignments; Stage 1: problem orientation; presentation of short stories about hypothetical problems and discussion of accurate problem definition, emotions, and solutions; assignment of tasks.
3	Review of assignments; Stage 2: problem definition and formulation; emphasis on precise problem definition, breaking problems into sub-problems, setting short-term goals, avoiding unattainable long-term goals and premature judgments; assignment of tasks.
4	Review of assignments; explanation of short- and long-term goals with examples; assistance in identifying personal life goals.
5	Instruction in brainstorming techniques and application to sample problems; generation of all possible solutions; assignment of tasks.
6	Review of assignments; continuation of Stage 3: generation of alternative solutions; emphasis on quantity over quality of solutions and postponing evaluation; addressing participants' difficulties; assignment of tasks.
7	Review of assignments; Stage 4: decision-making; evaluation and selection of optimal solutions based on short- and long-term consequences and alignment with personal values; assignment of tasks.
8	Review of assignments; continuation of decision-making; discussion of factors influencing decision-making, responsibility acceptance, risk tolerance, situational awareness, knowledge, and flexibility.
9	Explanation of common decision-making styles: emotional, impulsive, delegative, value-based, and rational; assignment of tasks.
10	Review of assignments; Stage 5: verification and review; selection, implementation, and evaluation of the best solution; assignment of tasks.
11	Review of assignments; emphasis on the importance of problem-solving skills across all aspects of life and their empowering role.
12	Emphasis on generalizing the problem-solving model to daily life activities; final questions and discussion.

Because the original 9-session protocol of D'Zurilla and Goldfried (1971) was expanded to 12 sessions, the content validity of the modified intervention was reassessed and confirmed using Lawshe's method.

Instrument

To assess the dependent variable of academic enthusiasm, the Vega Academic Enthusiasm Scale (2016) was used. This questionnaire consists of 20 items and four components: cognitive, emotional, behavioral, and agency. Items are rated on a Likert-type scale, with sample items such as "I spend a large portion of my free time searching for additional information about topics discussed in class."

The components include: Cognitive: Items 1–5, Emotional: Items 6–10, Behavioral: Items 11–15, Agency: Items 16–20 and Items 6, 10, 11, 12, 13, 14, and 15 were reverse-scored. The response range was from 1 (strongly disagree) to 6 (strongly agree).

In the study by Shafiei-Sarvestani and Askari (2019), the content, face, and criterion validity of the scale were confirmed, and Cronbach's alpha was reported to be above 0.70. In the present study, the Cronbach's alpha coefficient for the scale was 0.74.

Procedure and Data Analysis

Participants were assigned to four groups of 15 students each (three experimental groups and one control group). Initially, the pretest of the dependent variable was administered to all groups. Subsequently, the three experimental groups received the respective educational interventions, while the control group received no training.

The intervention sessions were conducted over one month, comprising 12 sessions (three sessions per week on Saturday, Monday, and Wednesday). Following the interventions, the posttest was administered to all groups.

After data collection, the data were coded, analyzed, and reported. Multivariate analysis of covariance (MANCOVA) and Bonferroni post hoc tests were used for inferential data analysis. All analyses were performed using SPSS software (Version 27).

Ethical Considerations

Informed consent was obtained from all participants prior to their inclusion in the study. Participants were informed about the purpose, procedures, duration, potential risks and benefits of the study, and were assured that their information would remain confidential and would not be disclosed. These conditions were presented in the form of a written consent form. Upon completion of the study, the benefits of self-regulation and academic help-seeking were explained to all participating students.

Inclusion Criteria

Informed consent from parents

Informed consent from students

No disruption to the students' academic schedule

No diagnosed psychological disorders

No chronic or underlying physical illnesses

No prior participation in self-regulation, help-seeking, or problem-solving training programs

Exclusion Criteria

Excessive student fatigue

Student withdrawal from participation

Parental withdrawal of consent

Academic decline during the study

Objections from teachers or school staff regarding continued participation

This study was approved under the ethical code IR-IAU.BA.REC.1403.081 and is registered on the National Research Ethics System of Iran.

Results

Table 4 presents the means and standard deviations of academic enthusiasm and its components (cognitive, affective, behavioral, and agency) for participants in the experimental and control groups at the pretest and posttest stages.

Table 4. Means and Standard Deviations of Academic Enthusiasm and Its Components for Experimental and Control Groups at Pretest and Posttest

Group	Measurement Time	Variable	Mean	SD	Mean	SD
			Pretest		**Posttest**	
Control		Cognitive component	14.66	3.59	16.73	3.71
		Affective component	13.20	3.96	15.13	3.73
		Behavioral component	14.06	2.76	16.26	3.15
		Agency component	11.86	3.75	14.06	3.86
		Academic enthusiasm (total)	53.80	6.64	62.20	7.01
Self-Regulation Training		Cognitive component	14.06	2.71	19.60	3.45
		Affective component	15.06	3.39	20.86	3.70
		Behavioral component	12.40	2.61	18.80	2.36
		Agency component	11.66	4.15	17.26	4.18
		Academic enthusiasm (total)	53.20	6.04	76.53	6.40
Problem-Solving Training		Cognitive component	15.06	2.96	21.53	3.60
		Affective component	13.86	3.26	20.20	3.78
		Behavioral component	12.13	2.53	18.40	3.22
		Agency component	13.13	4.29	18.93	4.57
		Academic enthusiasm (total)	54.20	7.53	79.06	8.77
Academic Help-Seeking Training		Cognitive component	13.66	3.01	16.46	3.64
		Affective component	15.13	4.15	17.60	4.35
		Behavioral component	13.93	2.49	16.53	2.32
		Agency component	14.13	3.88	16.73	4.30
		Academic enthusiasm (total)	56.86	3.52	67.33	4.59

The results presented in Table 4 indicate that in the control group and the academic help-seeking training group, the mean scores of the dependent variables at the posttest stage did not show substantial changes compared to the pretest stage. In contrast, in the self-regulation training and problem-solving training groups, the mean scores of academic enthusiasm and all its components demonstrated a notable increase at posttest compared to pretest.

However, determining whether these observed changes are statistically significant requires inferential statistical analyses, which are presented in the following sections.

Prior to testing the research hypotheses, the underlying assumptions of analysis of covariance (ANCOVA/MANCOVA) were examined. The normality of the research variables was assessed using the Kolmogorov–Smirnov test. The results indicated that the p-values for academic enthusiasm and its components were greater than 0.05, suggesting no significant deviation from normality. Since the null hypothesis of this test assumes no difference between the empirical data distribution and the normal distribution, the results support the assumption that the data are normally distributed.

To examine the homogeneity of variances, Levene's test was conducted. The obtained F value for academic enthusiasm was 0.75, which was not statistically significant ($p > 0.05$). Therefore, the variances of the groups were not significantly different, and the assumption of homogeneity of variances was confirmed.

To investigate the effects of the independent variables (interventions), a multivariate analysis of covariance (MANCOVA) was conducted on posttest scores, while controlling for pretest scores of the dependent variables. Table 5 presents the results of the multivariate analysis of covariance for the components of academic enthusiasm.

Table 5. Results of Multivariate Analysis of Covariance (MANCOVA)

Effect	Test	Value	F	Hypothesis df	Error df	Sig.	Partial η^2
Group	Pillai's Trace	0.970	6.092	12	153	0.0001	0.323
	Wilks' Lambda	0.091	16.016	12	129.933	0.0001	0.551
	Hotelling's Trace	9.378	37.251	12	143	0.0001	0.758
	Roy's Largest Root	9.306	118.653	4	51	0.0001	0.903

Based on Wilks' Lambda results presented in Table 5 ($F = 16.016$, $p = 0.0001$), it can be inferred that there is a statistically significant difference among at least two of the four groups with respect to at least one component of academic enthusiasm.

To determine which specific components and which groups account for these differences, follow-up univariate ANCOVAs and Bonferroni post hoc tests were conducted. The results of the

univariate covariance analyses for each component of academic enthusiasm are reported in the subsequent table.

Table 6. Results of Univariate Analysis of Covariance (ANCOVA) for the Components of Academic Enthusiasm

Variable	Sum of Squares	df	Mean Square	F	Sig. (p)	Power
Cognitive component	600.277	1	600.277	331.662	0.0001	0.864
Affective component	706.709	1	706.709	399.005	0.0001	0.885
Behavioral component	360.388	1	360.388	281.371	0.0001	0.844
Agency component	823.460	1	823.460	525.347	0.0001	0.910

As shown in Table 6, the obtained F statistics for all four components of academic enthusiasm are statistically significant at an acceptable level ($p < 0.05$). In addition, the statistical power for all variables exceeds 0.80, which is considered satisfactory based on established statistical criteria. These findings indicate that there is a statistically significant difference among at least two of the study groups with respect to each of the four components of academic enthusiasm. To identify the exact location of these differences, Bonferroni post hoc tests were conducted. The results of these comparisons are presented in Table 7.

Table 7. Results of Bonferroni Post Hoc Tests for the Components of Academic Enthusiasm

Variable	Group comparison	Mean difference	Std. error	P
Cognitive component	Control – Self-regulation	-3.446	.514	.000
	Control – Problem-solving	-4.296	.517	.000
	Control – Help-seeking	-.765	.518	.871
	Self-regulation – Problem-solving	-.850	.504	.588
	Self-regulation – Help-seeking	2.681	.513	.000
	Problem-solving – Help-seeking	3.530	.519	.000
Affective component	Control – Self-regulation	-3.779	.508	.000
	Control – Problem-solving	-4.314	.512	.000
	Control – Help-seeking	-.596	.512	1.000
	Self-regulation – Problem-solving	-.535	.499	1.000
	Self-regulation – Help-seeking	3.183	.507	.000
	Problem-solving – Help-seeking	3.718	.514	.000
Behavioral component	Control – Self-regulation	-4.157	.432	.000
	Control – Problem-solving	-3.943	.435	.000
	Control – Help-seeking	-.344	.435	1.000
	Self-regulation – Problem-solving	.214	.424	1.000
	Self-regulation – Help-seeking	3.813	.431	.000
	Problem-solving – Help-seeking	3.599	.437	.000
Agency component	Control – Self-regulation	-3.565	.478	.000
	Control – Problem-solving	-3.710	.481	.000
	Control – Help-seeking	-.481	.482	1.000
	Self-regulation – Problem-solving	-.145	.469	1.000
	Self-regulation – Help-seeking	3.084	.477	.000
	Problem-solving – Help-seeking	3.229	.483	.000

Summary and Interpretation of Bonferroni Results

Self-regulation training and problem-solving training had significant positive effects on the cognitive component of academic enthusiasm ($p < 0.05$), whereas academic help-seeking training did not demonstrate a significant effect ($p > 0.05$). No significant difference was observed between self-regulation and problem-solving training; however, both were significantly more effective than help-seeking training.

Self-regulation training and problem-solving training were also significantly effective in improving the affective component of academic enthusiasm ($p < 0.05$), while help-seeking training showed no significant effect. Again, no significant difference was found between self-regulation and problem-solving training, but both outperformed help-seeking training.

Regarding the behavioral component, both self-regulation and problem-solving training led to significant improvements ($p < 0.05$), whereas help-seeking training did not yield a statistically significant effect. The effectiveness of self-regulation and problem-solving training did not differ significantly, but both were significantly more effective than help-seeking training.

Similar results were obtained for the agency component, where self-regulation and problem-solving training produced significant positive effects ($p < 0.05$), while help-seeking training did not. No significant difference was observed between self-regulation and problem-solving training; however, both were significantly more effective than help-seeking training.

Based on the above results, it can be concluded that self-regulation training and problem-solving training exerted equally significant effects on all four components of academic enthusiasm. However, these two interventions were more effective than academic help-seeking training in enhancing students' academic enthusiasm.

Accordingly, the second subsidiary hypothesis is confirmed:

The effectiveness of self-regulation training, academic help-seeking training, and problem-solving training on academic enthusiasm among male lower secondary school students in Bandar Abbas differs significantly.

Discussion

The findings related to the second sub-hypothesis are consistent with the results reported by Darabi et al. (2022), Kabini-Moghadam et al. (2019), and Tattredel & Parkinson (1999).

To interpret these findings, it is first essential to address the effectiveness of self-regulation training and problem-solving training on the cognitive, affective, behavioral, and agency components of academic enthusiasm, followed by the noted absence of difference between the effectiveness of these two methods.

Learning self-regulation strategies enhance students' sense of competence and internal control, which, in turn, increases their enthusiasm for learning. When students experience a feeling of self-efficacy and internal control, they view educational activities as ways to fulfill their personal needs, aligning academic goals with personal goals, and hence perceive study as a meaningful pursuit, thereby strengthening their enthusiasm for education.

Self-regulation learning strategies improve goal setting, problem-solving, and decision-making abilities, enabling learners to assess their skills, identify preferences, interests, strengths, and weaknesses, consider multiple dimensions of an issue, and foresee consequences when making decisions. These processes also expand self-defense, self-evaluation, independent performance, adaptability, self-confidence, and creativity, ultimately heightening students' academic enthusiasm (Kabini-Moghadam et al., 2019).

Moreover, teaching self-regulatory strategies makes the students' cognitive and intellectual processes more dynamic (Samadian et al., 2019). Since dimensions of academic performance are directly influenced by rational and cognitive processes, the confirmed impact of these strategies on academic motivation is not unexpected. By applying self-regulation strategies, students gain opportunities to practice and accumulate experiences, promoting academic achievement, which further reinforces their belief in their own capabilities. These positive self-perceptions lead to increased motivation. Consequently, students show greater interest toward academic content and learning environments, which results in heightened enthusiasm for learning (Darabi et al., 2022).

Explanation of Components

Each of the four components of academic enthusiasm can be discussed more precisely:

Cognitive component: relates to individuals' mental orientation and understanding of the subject matter. A cognitively enthusiastic person maintains a positive mindset toward goals and

demonstrates readiness within the learning context. Self-regulation training brings order to thoughts and mental processes, generating cognitive coherence that helps the learner clearly perceive and express enthusiasm toward learning.

Affective component: refers to conscious personal interests and preferences toward specific matters. Individuals, according to their personal value hierarchy, prioritize certain goals over others, investing greater emotional energy in them. Through self-regulation training, learners develop the ability to prioritize important goals over less significant ones; this skill produces positive emotional engagement with learning tasks.

Behavioral component: reflects what is externally exhibited as observable actions. Self-regulation training maintains a direct relationship with behavioral monitoring and control. A well-self-regulated student knows how to manage behaviors and display enthusiastic actions when motivated toward educational goals.

Agency component: pertains to situations where the individual consciously acts in line with inner enthusiasm. Unlike the behavioral component, which may reflect unexamined actions, agency involves intentional execution of internal motivation. Here, the learner becomes the active agent of mental intentions during activities of personal interest. Self-regulation nurtures metacognitive learning, enhancing awareness of one's learning processes and cognitive functions. This allows the learner to effectively and purposefully transform positive mental intentions into action.

Problem-solving skills help students recognize that challenges are manageable rather than catastrophic. Learning these skills encourages students to generate, apply, and evaluate multiple alternative solutions when facing problems (Samadian et al., 2019).

As a cognitive-behavioral strategy, problem-solving emphasizes both mental and behavioral dimensions, acting as a shield against negative experiences. Group-based problem-solving training fosters a range of cognitive skills—such as observation, comparison, information organization, variable identification and control, hypothesis formation, analysis, inference, and judgment—which strengthen students' analytic and evaluative capacities (Ghadampour et al., 2018).

Students trained in problem-solving learn to replace impulsive or avoidant decisions with decisive, evaluative decisions, revisiting the outcomes and identifying weaknesses and strengths. In coping with environmental or educational challenges, once the alarm stage of stress arises, they enter a

resistance stage, mobilizing energy to manage the stressor. The quicker and more effectively they solve the problem, the lower the energy expenditure, reducing the likelihood of reaching the fatigue stage, and consequently increasing their enthusiasm for addressing new challenges.

Thus, individuals with strong problem-solving abilities can successfully overcome difficulties and minimize the negative impact of unresolved problems on biological, psychological, social, and academic dimensions, ultimately leading to a marked rise in academic enthusiasm (Darabi et al., 2022).

Students trained in problem-solving gain mastery over: Information organization, fostering mental coherence around topics that sustain enthusiasm (explaining the cognitive effect); Evaluation processes, prioritizing emotional values according to their utility and importance (explaining the affective effect); Behavioral control, managing actions and avoiding impulsive behaviors (explaining the behavioral effect); Reasoning and inference, identifying goal-directed behaviors that express internal enthusiasm (explaining the agency effect). Accordingly, the effectiveness of problem-solving training on all components of academic enthusiasm is fully justified and theoretically supported.

Comparative Evaluation

Given the presented discussion, the strong and comprehensive impact of both problem-solving and self-regulation training on the four components of academic enthusiasm can be clearly explained. It is thus reasonable that these two robust approaches act similarly in improving the same components. The superior influence of these two methods compared to academic help-seeking training can be attributed to the underlying nature of the latter. Help-seeking relies on dependence on others within social contexts, whereas self-regulation and problem-solving training emphasize individual coherence, self-organization, and autonomy. Since academic enthusiasm is rooted not in social dependency but in inner cognitive and emotional integration, the difference in effectiveness between help-seeking and the other two methods is entirely logical and theoretically consistent.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by ethics committee of Islamic Azad University.

Author contributions

All authors contributed to the study conception and design, material preparation, data collection and analysis. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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