Iranian Evolutionary Educational Psychology Journal
IEEPJ
University of Hormozgan
Online ISSN: 2588 - 4395
Homepage: https://ieepj.hormozgan.ac.ir

Comparing the Effectiveness of Self-Regulation Training, Academic Help-Seeking Training and Problem-Solving Training on Academic Motivation

Neda Pegah[1], Kobra Hajializadeh[2]✉, Abdolavahab Samavi[3], Azita Amirfakhraee[4]

1. PhD student, Department of Psychology, BA.C., Islamic Azad University, Bandar Abbas, Iran
2. Associate Professor, Department of Psychology, BA.C., Islamic Azad University, Bandar Abbas, Iran.
Corresponding author: hajializadehk@iau.ac.ir
3. Professor, Department of Education, University of Hormozgan, Bandar Abbas, Iran
3. Associate Professor, Department of Psychology, BA.C., Islamic Azad University, Bandar Abbas, Iran

Article Info

Article type:
Research Article

Article history:

Received 19 Feb. 2025

Received in revised form 11 Apr. 2025

Accepted 16 Jul. 2025

Published online 01 Dec. 2025

Keywords:
Self-regulation training,
Help-seeking training,
Problem-solving training,
Academic motivation,
High school students

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 motivation of male junior high school students in Bandar Abbas.

Methods: This applied study employed a quasi-experimental design with a pretest–posttest control group. The statistical population consisted of all male junior high school students enrolled in schools in Bandar Abbas during the 2023–2024 academic year. Using available 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 students per group). Academic motivation was measured using Harter's Academic Motivation Scale (1980). The experimental groups received 12 training sessions over one month based on standard intervention protocols, while the control group received no intervention. Data were analyzed using SPSS version 27, employing multivariate analysis of covariance (MANCOVA) and Bonferroni post hoc tests.

Results: The results of MANCOVA indicated a significant difference among the groups in posttest academic motivation scores ($P < 0.05$). Bonferroni post hoc comparisons showed that self-regulation training and problem-solving training significantly increased students' academic motivation compared to the control group. In contrast, academic help-seeking training did not produce a significant improvement in academic motivation. Additionally, no significant difference was found between the effects of self-regulation training and problem-solving training on academic motivation.

Conclusions: The findings suggest that self-regulation and problem-solving training are effective interventions for enhancing academic motivation among male junior high school students, whereas academic help-seeking training alone may be insufficient. Educational planners and school counselors are encouraged to incorporate self-regulation and problem-solving skills training into school-based intervention programs to improve students' academic motivation.

Cite this article: Pegah, N., Hajializadeh, K., Samavi, A. & Amirfakhraee, A. (2025). Comparing the effectiveness of self-regulation training, academic help-seeking training and problem-solving training on academic motivation. *Iranian Evolutionary Educational Psychology Journal*, 7 (4), 1-17.
DOI: https//doi.org/ 10.22034/7.4.1

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Publisher: University of Hormozgan.
DOI: https// doi.org/ 10.22034/7.4.1

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Introduction

One of the major challenges within the educational environment of early adolescents in lower secondary schools is the lack of academic motivation. The complex and rapidly changing conditions of contemporary society require individuals to engage in continuous learning of new knowledge and skills. However, this process cannot be realized without adequate motivation. Motivation is regarded by psychologists and educational scholars as one of the fundamental concepts for explaining different levels of performance, accounting for variations in effort devoted to academic tasks and learning behaviors. Motivation refers to the process that energizes and directs behavior. Academic motivation is a key psychological factor in academic achievement and represents cognitive, emotional, and behavioral investment in educational success (Jalilzadeh & Zarei, 2018). Given that many researchers in the field of educational psychology have identified motivation as the cornerstone of academic success (Alfaki & Al-Biali, 2023; Cotra et al., 2023; Wang et al., 2023; Martin et al., 2023; Camberlin et al., 2023), there is a clear need to enhance this construct within educational settings through appropriate intervention methods.

Evidence from recent studies indicates that self-regulation training has exerted significant effects on a wide range of positive and negative constructs in educational psychology (Bushoff et al., 2023; Núñez et al., 2022; Sáiz-Manzanares et al., 2022; Sinnering et al., 2022; De La Fuente et al., 2022). These effects have been favorably reflected in improving the educational climate of lower secondary schools (Darabi et al., 2022). Self-regulated learning can increase individuals' capacity to adjust their behaviors in response to external and internal environmental conditions and changes (Chitra et al., 2022). The self-regulation of cognition and behavior constitutes a crucial aspect of students' learning and academic performance in classroom environments. In general, self-regulation theories explain why and how students engage in learning and what they need to know about themselves and their academic tasks in order to learn independently. In other words, these theories clarify how students direct their own learning and how the selection of cognitive, metacognitive, and behavioral strategies enhances their effort (Jalilzadeh & Zarei, 2018).

Self-regulated learning is defined as "self-generated thoughts, feelings, and actions that are planned and cyclically adapted to achieve personal goals." It can be organized into three phases: (1) forethought, (2) performance, and (3) self-reflection. In the forethought phase, students engage in task analysis (i.e., goal setting and planning to achieve those goals) and motivational beliefs

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(such as self-efficacy, outcome expectations, intrinsic interest/value, and goal orientation) to activate learning. In the performance phase, learners carry out the 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 maintain engagement (Reparaz, 2020). Based on existing research in educational psychology, it appears that academic help-seeking training can positively influence positive psychological constructs and negatively influence maladaptive psychological variables. According to Butler (2013), academic help-seeking is an active effort to utilize available resources in order to achieve success. In the academic help-seeking process, learners must first recognize that a task is difficult and that they are unable to complete it independently, thus requiring assistance from others. In the next step, learners consider all available information and decide whether or not to seek help. Therefore, appropriate training in help-seeking strategies can contribute to increasing positive psychological constructs (Nuh-Pour et al., 2019). When students are exposed to help-seeking training, they tend to seek assistance from teachers or knowledgeable peers to improve their academic progress. Help-seeking enables students not only to resolve academic difficulties but also to actively participate in classroom activities, thereby enhancing their motivation to learn (Newman, 2023). Accordingly, academic help-seeking training may be an effective approach for addressing the educational issues highlighted in the present study.

The central concern of this research is the weakness of lower secondary school students in indicators such as test anxiety, academic motivation, academic engagement, and academic optimism. According to the consensus among educational psychology researchers, each of these constructs can hinder the healthy growth and development of adolescents within educational contexts (Zhang et al., 2019; Martin et al., 2023; Baytemir, 2023; Smith, 2023). Meanwhile, the problem-solving process seeks to eliminate students' emotional and cognitive barriers. Therefore, it seems that implementing problem-solving training can yield desirable outcomes in the target variables. From the perspective of problem-solving scholars, this issue is considered one of the key challenges of educational systems worldwide (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 constitute a cognitive-behavioral process through which individuals identify and discover effective coping strategies for problematic

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life situations (Puyisa et al., 2020). In other words, problem solving is a crucial coping strategy that enhances personal and social competence and progress while reducing stress and psychological difficulties (Kim et al., 2019).

Mehdizadeh et al. (2024) found that a self-regulation training package based on creative drama was significantly more effective than a control condition in improving academic achievement motivation and academic self-regulation among elementary school students. Darabi et al. (2022) reported that self-regulation training and problem-solving skills training were effective in enhancing students' academic engagement and academic resilience. Najafi (2022) concluded that academic help-seeking strategies, when properly designed, planned, and implemented alongside psychological constructs such as academic well-being and engagement, can positively affect academic performance. Nuh-Pour et al. (2019) found that problem-solving skills training was more effective than help-seeking strategies training in improving students' academic self-efficacy, although help-seeking training was also beneficial. Kabini-Moqaddam et al. (2019) demonstrated that training in self-regulated learning strategies and help-seeking increased academic engagement among procrastinating students. Additionally, Ozdin et al. (2023), in a study titled "Problem-Solving Method: Effectiveness in Learning and Motivation in Physical Education", reported that motivational dimensions—including identified regulation and intrinsic motivation—were significantly higher in the experimental group than in the control group. Moreover, students' motor engagement in learning situations increased only in the experimental group. The problem-solving method was identified as an effective strategy for enhancing motor skills, performance, and motivation in physical education contexts.

In light of the perceived educational problems among lower secondary school students and considering the researcher's aim to identify the most effective method for improving academic motivation, the present study sought to clearly and systematically examine the effectiveness of self-regulation training, academic help-seeking training, and problem-solving training on academic motivation among male lower secondary school students in Bandar Abbas.

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Material and Methods

The present study was applied in terms of purpose and employed a quasi-experimental design with a pretest–posttest control group in terms of 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 (1402–1403). An available (convenience) sampling method was used. One male lower secondary school in Bandar Abbas was invited to participate in the study. Based on prior research, a sample size of 15 students per group was determined. Given the inclusion of four groups (three experimental groups and one control group), the total sample size was 60 students. Participants were randomly assigned to the self-regulation training group, academic help-seeking training group, problem-solving training group, or control group.

Intervention Programs

Self-Regulation Training: To implement the independent variable of self-regulation training, 12 sessions of 90 minutes each were conducted. The intervention was based on the protocol developed by Pintrich and De Groot (1990). The session content is presented in Table 1.

Table 1. Self-Regulation Training Sessions

Session	Content
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 enables students to attend to, recognize, encode, and store information in memory
3	Training in elaboration strategies, emphasizing linking new information to prior knowledge to enhance retention
4	Explanation of organization strategies as an effective method for learning complex materials through categorization based on similarities and differences
5	Introduction to metacognition and planning strategies, including coordination between learning resources and time, and specifying task order, timing, and quality
6	Practical instruction in monitoring and control strategies to increase awareness of learning progress, guidance, and self-evaluation
7	Training in regulation strategies aligned with monitoring and control, including adjusting study pace and modifying cognitive strategies
8	Instruction on time management strategies to help students adapt to and modify their environment to meet goals and needs
9	Training in selecting an appropriate study environment (physical conditions, distraction control, resources, and social support); instruction in resource-management strategies, help-seeking, effort regulation, and appropriate social help-seeking behaviors
10	Explanation of motivation and self-efficacy beliefs and their influence on students' academic activities
11	Instruction on goal orientation, its role in self-regulated learning, and characteristics of effective, realistic, and attainable goals
12	Explanation of academic delay of gratification, its role in self-regulated learning, and its importance for students

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Due to the adaptation of the original 15-session protocol to 12 sessions, the content validity of the modified program was reassessed and confirmed using Lawshe's method, yielding an acceptable content validity ratio.

Academic Help-Seeking Training: To implement the independent variable of academic help-seeking training, 12 sessions of 90 minutes were conducted based on the protocol of D'Zurilla and Goldfried (1971). Session content is presented in Table 2.

Table 2. Academic Help-Seeking Training Sessions

Session	Content
1	Introduction to help-seeking strategies and their role and importance in effective learning
2	Training on appropriate timing and expression of help-seeking
3	Identifying knowledgeable teachers and peers; training on when and how to approach informed individuals
4	Mental rehearsal for problem identification and analysis through planning a short research trip as a group leader
5	Training in academic and social goals, self-belief, and emotional regulation to tolerate problems and reduce negative perceptions
6	Training in effective explanations and 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 for problem-solving planning
9	Pair work: one student reads and summarizes content while the other identifies errors and provides feedback
10	Instruction in problem solving and verbalizing reasoning using metacognitive cues
11	Training in independent work, receiving hints, and requesting partial guidance
12	Instruction on the importance of providing help to others; practice activities and practical implementation

Problem-Solving Training: To implement the independent variable of problem-solving training, 12 sessions of 90 minutes were conducted, also based on the D'Zurilla and Goldfried (1971) protocol. Session content is summarized in Table 3.

Table 3. Problem-Solving Training Sessions

Session	Content
1	Definition of problem-solving skills; group participation rules; role and necessity of problem solving in daily life; exploration of members' interests and concerns
2	Review of previous assignments; Phase 1: problem orientation; analysis of hypothetical problem scenarios and emotional responses; assignment
3	Review of assignments; Phase 2: problem definition and formulation; emphasis on precise problem definition, breaking problems into subcomponents, setting short-term goals, and avoiding premature judgments; assignment
4	Review of assignments; explanation of short- and long-term goals with examples; clarification of personal life goals
5	Instruction in brainstorming techniques; generation of multiple solutions for sample problems; assignment
6	Review of assignments; continuation of Phase 3: generation of alternative solutions; emphasis on quantity over quality and postponement of evaluation; assignment
7	Review of assignments; Phase 4: decision making; evaluation of solutions based on short- and long-term consequences and alignment with personal values; assignment
8	Continuation of decision-making phase; discussion of factors influencing decisions such as responsibility acceptance, risk tolerance, situational understanding, information, and flexibility

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9	Instruction in common decision-making styles (emotional, impulsive, delegating, value-based, and rational); assignment
10	Review of assignments; Phase 5: implementation and verification of the selected solution; evaluation of outcomes; assignment
11	Review of assignments; emphasis on the importance of problem-solving skills in all life domains and personal empowerment
12	Emphasis on generalizing problem-solving skills to daily activities; final questions and discussion

Because the original 9-session protocol was expanded to 12 sessions, content validity was reassessed using Lawshe's method, and the resulting coefficient was confirmed as acceptable.

Measurement Instrument

Academic motivation was assessed using the Harter Academic Motivation Scale (1980). The scale consists of 33 items designed to measure academic motivation among students. It is a revised version of Harter's original scale (1981), which assessed intrinsic and extrinsic motivation using bipolar items. Given that both intrinsic and extrinsic motives often coexist in academic contexts, Lepper et al. (2005) revised the scale into a Likert-type format, which was used in the present study. Responses were scored on a 5-point Likert scale (1–5). The subscales included:

Intrinsic Motivation: Items 1, 2, 6, 7, 8, 12, 13, 14, 18, 19, 20, 24, 25, 26, 29, 30, 33

Extrinsic Motivation: Items 3, 4, 5, 9, 10, 11, 15, 16, 17, 21, 22, 23, 27, 28, 31, 32

The reliability of the questionnaire was previously reported by Zahiri and Rajabi (2009) with a Cronbach's alpha of 0.92. Content validity was confirmed by expert review. In the present study, Cronbach's alpha was 0.81, indicating acceptable internal consistency.

Procedure: Participants were assigned to four groups of 15 students (three experimental groups and one control group). First, the pretest of academic motivation was administered. Subsequently, the intervention programs were implemented for the three experimental groups, while the control group received no training. The interventions were conducted over one month, consisting of 12 sessions (three sessions per week on Saturdays, Mondays, and Wednesdays). After completion of the interventions, the posttest was administered.

Data Analysis: Data were collected, coded, and analyzed using SPSS version 27. Multivariate analysis of covariance (MANCOVA) and Bonferroni post hoc tests were employed for inferential data analysis.

Ethical Considerations: Informed consent was obtained from all participants. Students and their parents were informed about the study objectives, procedures, duration, potential risks, and

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benefits. Confidentiality of data was assured, and participation was voluntary. Written informed consent was obtained. Upon completion of the study, the benefits of self-regulation and help-seeking training were explained to all participants.

Inclusion Criteria

Informed consent from parents

Informed consent from students

No disruption to the student's academic schedule

Absence of diagnosed psychological disorders

Absence of chronic physical illness

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

Exclusion Criteria

Excessive student fatigue

Student's withdrawal of consent

Parental withdrawal of consent

Academic decline during the study

Objection from teachers or school staff regarding continued participation

The study was approved by the Ethics Committee under the code IR-IAU.BA.REC.1403.081 and is registered in the National Research Ethics System for Biomedical Studies of Iran.

Results

Table 4 presents the means and standard deviations of academic motivation and its components (intrinsic and extrinsic motivation) for participants in the experimental and control groups at the pretest and posttest stages.

Table 4. Means and Standard Deviations of Academic Motivation for Experimental and Control Groups

Group	Measurement Stage	Intrinsic Motivation (M ± SD)	Extrinsic Motivation (M ± SD)	Academic Motivation (M ± SD)
Control	Pretest	39.26 ± 8.10	41.46 ± 7.42	80.73 ± 10.03
	Posttest	41.73 ± 7.86	44.26 ± 7.55	86.00 ± 9.46
Self-Regulation Training	Pretest	43.33 ± 6.34	37.73 ± 5.02	81.06 ± 8.04
	Posttest	55.13 ± 6.51	55.33 ± 8.38	110.46 ± 7.09
Problem-Solving Training	Pretest	43.86 ± 8.52	35.00 ± 8.80	78.86 ± 13.34
	Posttest	55.93 ± 7.36	48.80 ± 7.97	104.73 ± 10.01
Academic Help-Seeking Training	Pretest	40.26 ± 8.48	37.13 ± 7.95	77.40 ± 10.81
	Posttest	45.53 ± 8.85	39.53 ± 7.58	85.06 ± 13.51

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As shown in Table 4, the control group and the academic help-seeking training group exhibited only minor changes in mean scores from pretest to posttest. In contrast, the self-regulation training and problem-solving training groups demonstrated substantial increases in the mean scores of the dependent variables at the posttest stage. Determining whether these changes were statistically significant required inferential statistical analyses, which are reported below. Prior to testing the research hypotheses, the assumptions underlying covariance analysis were examined.

Normality of the research variables was assessed using the Kolmogorov–Smirnov test. The results indicated that the Type I error probability (p-value) for the dependent variables exceeded 0.05, suggesting no significant deviation from normality. Therefore, the null hypothesis—indicating no difference between the normal distribution and the empirical data distribution—was not rejected, and the data were considered normally distributed. Homogeneity of variances was evaluated using Levene's test. For academic motivation, the obtained F value was 2.41, which was not statistically significant ($p > 0.05$). This result indicates that the variances across groups did not differ significantly, confirming the assumption of homogeneity of variances.

To examine the effects of the independent variables, a multivariate analysis of covariance (MANCOVA) was conducted on posttest scores while controlling for pretest scores of the dependent variables.

Table 5. Multivariate Analysis of Covariance Results for Academic Motivation Components

Effect	Test	Value	F	Hypothesis df	Error df	p	Effect Size
Group	Pillai's Trace	0.616	8.01	6	108	<0.001	0.308
	Wilks' Lambda	0.420	9.60	6	106	<0.001	0.352
	Hotelling's Trace	1.299	11.26	6	104	<0.001	0.394
	Roy's Largest Root	1.231	22.15	3	54	<0.001	0.552

Based on Wilks' Lambda ($F = 9.60$, $p < 0.001$), it can be inferred that there was a statistically significant difference among at least two of the four groups with respect to at least one component of academic motivation. To identify the specific components and group differences, univariate ANCOVA and Bonferroni post hoc tests were conducted. Table 6 presents the results of univariate ANCOVA for each component of academic motivation.

Table 6. Univariate ANCOVA Results for Academic Motivation Components

Variable	Sum of Squares	df	Mean Square	F	p	Observed Power
Intrinsic Motivation	713.424	1	713.424	12.433	0.002	0.635
Extrinsic Motivation	388.066	1	388.066	6.890	0.011	0.513

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The results indicate that the F values for both components of academic motivation were statistically significant ($p < 0.05$). Additionally, the observed statistical power for both variables exceeded 0.50, which is considered acceptable. These findings suggest that at least two groups differed significantly in both intrinsic and extrinsic motivation. To determine the exact location of the differences, Bonferroni post hoc tests were performed. The results are presented in Table 7.

Table 7. Bonferroni Post Hoc Test Results for Academic Motivation Components

Variable	Group Comparison	Mean Difference	Standard Error	P
Intrinsic Motivation	Control – Self-Regulation	−12.004	2.858	0.001
	Control – Problem-Solving	−12.221	2.958	0.001
	Control – Help-Seeking	−2.848	2.830	0.999
	Self-Regulation – Problem-Solving	−0.217	2.792	0.999
	Self-Regulation – Help-Seeking	9.155	2.795	0.011
	Problem-Solving – Help-Seeking	9.373	2.818	0.010
Extrinsic motivation	Control – Self-Regulation	−12.847	2.831	<0.001
	Control – Problem-Solving	−7.341	2.930	0.009
	Control – Help-Seeking	3.086	2.804	0.999
	Self-Regulation – Problem-Solving	5.505	2.766	0.310
	Self-Regulation – Help-Seeking	15.933	2.769	0.001
	Problem-Solving – Help-Seeking	10.428	2.792	0.003

The results in Table 7 indicate that self-regulation training and problem-solving training had a significant positive effect on intrinsic motivation ($p < 0.05$), whereas academic help-seeking training did not produce a significant effect ($p > 0.05$). No significant difference was observed between the effectiveness of self-regulation and problem-solving training; however, both were significantly more effective than help-seeking training. Self-regulation training and problem-solving training also had a significant positive effect on extrinsic motivation ($p < 0.05$), while academic help-seeking training was not statistically effective ($p > 0.05$). Again, no significant difference was found between self-regulation and problem-solving training, but both outperformed help-seeking training. Taken together, these findings indicate that self-regulation training and problem-solving training exerted equivalent and superior effects on both components of academic motivation compared to academic help-eking training. Accordingly, the first subsidiary hypothesis was supported:

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

Discussion

The findings of the present study are consistent with the results reported by Mehdizadeh et al. (2024), Samadian and Panah-Ali (2019), Jalilzadeh and Zarei (2018), Azadin et al. (2023), and Tatterdell and Parkinson (1999).

In explaining the findings related to the first subsidiary hypothesis, it is necessary to address, first, the effectiveness of self-regulation training and problem-solving training on intrinsic and extrinsic academic motivation, and second, the absence of a significant difference in effectiveness between these two approaches. Academic motivation is one of the key psychological determinants of academic achievement and reflects the cognitive, emotional, and behavioral investment individuals make in educational progress. Deci and Ryan (1985), in their Self-Determination Theory, examined the nature and mechanisms of academic motivation, conceptualizing motivation as the energization and direction of behavior toward goal-oriented activities. Given the crucial role of motivation in societal and educational advancement, this construct has consistently attracted scholarly attention.

Factors influencing academic motivation can be broadly categorized into individual characteristics and dispositions, and environmental factors, including the family, school, and broader social context (Jalilzadeh & Zarei, 2018). The core framework of self-regulated learning theory is based on how learners organize and manage their learning processes in terms of metacognitive beliefs, motivational processes, and behavioral strategies. Self-regulated learning refers to an individual's capacity to adapt behavior in response to internal and external conditions and encompasses the ability to organize, monitor, and self-manage behaviors in pursuit of diverse learning goals. This construct consists of two main components: motivational strategies and learning strategies (Soleimannejad & Hosseininasab, 2012).

Accordingly, self-regulation training, which simultaneously influences individuals' internal cognitive processes and external behaviors, promotes positive changes in both intrinsic and extrinsic motivation by organizing thoughts (internal) and actions (external). Empirical evidence

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indicates that self-regulatory strategies significantly enhance academic motivation and reduce test anxiety. These strategies—such as goal setting, self-control, self-evaluation, and self-motivation—enable students to manage their learning processes more effectively and sustain higher levels of motivation for academic success. Research has shown that instruction in self-regulation strategies exert a stronger impact on both intrinsic and extrinsic motivation compared with many other learning approaches. Such training strengthens students' goal orientation in learning, enhances their motivational engagement, and reduces procrastination, ultimately leading to improved academic performance.

Similarly, problem-solving skills training enhances students' awareness of their own abilities and fosters appreciation of these abilities, thereby increasing academic motivation. Through deliberate, logical, and reflective decision-making, students develop a more positive self-concept. Individuals with a more positive self-concept and favorable perceptions of their own competencies tend to demonstrate higher levels of motivation. Instruction in problem-solving skills promotes more positive attitudes toward oneself and life in general (Azimi et al., 2013).

The capabilities that enable students to engage in self-regulation operate across three interconnected levels: regulation of information processing strategies, regulation of the learning process, and regulation of the self. In self-regulated learning, students advance their academic processes by setting challenging goals, employing appropriate strategies to achieve those goals, and identifying self-regulatory factors that activate and guide their efforts. Such learners are characterized by efficient management of their learning experiences, active participation in academic tasks, autonomy, and high levels of metacognitive engagement. Overall, the central theme across self-regulation theories is the active engagement of learners in learning tasks. Through such engagement, students are able to direct their thoughts, emotions, and behaviors in ways that positively influence both learning outcomes and motivation.

In self-regulation training, skills such as acquiring, organizing, and storing knowledge, facilitating access to information, planning, monitoring, and controlling learning activities, time management, effort regulation, selection of appropriate study environments, seeking help from others, note-taking, highlighting key information, and reviewing content are explicitly taught. The integration and repeated practice of these skills lead to improved academic performance. By structuring learners' thinking patterns and study behaviors, these strategies enable students to gain

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control over their learning processes and to plan more effectively. Continued practice of these skills appears to produce long-term improvements in academic achievement. Students who frequently employ self-regulation strategies attempt to make learning meaningful by connecting new information to prior knowledge, monitoring their cognitive processes, creating conducive learning environments, and thereby enhancing their academic performance. Moreover, students with higher levels of self-efficacy tend to use a wider range of cognitive and metacognitive strategies.

From another perspective, a fundamental element of problem-solving is the application of previously acquired knowledge and skills to novel situations. In Gagné's theory, problem-solving is conceptualized as a form of higher-order rule learning, whereby learners integrate multiple lower-level rules to construct higher-level principles that facilitate problem resolution. Thus, problem-solving requires the recombination of prior learning in new and meaningful ways. The use of problem-solving approaches demands creative thinking, organized cognition, and relatively high intellectual capabilities, which may not be equally developed in all students (Feyzimansh et al., 2016).

Based on the foregoing discussion, several conclusions can be drawn. First, the effectiveness of self-regulation training and problem-solving training in enhancing intrinsic and extrinsic academic motivation is theoretically sound and empirically justifiable. Second, given that both approaches share a common theoretical foundation and rely on the interaction between individuals' internal cognitive processes and external behaviors, their levels of effectiveness do not differ significantly. Third, in light of the lack of effectiveness of academic help-seeking training, self-regulation and problem-solving training demonstrate greater and more meaningful potential for enhancing both intrinsic and extrinsic academic motivation.

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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.

Funding

The authors did (not) receive support from any organization for the submitted work.

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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