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The Effectiveness of Group Problem-Solving Skills Training on Academic Achievement Motivation and Academic Self-Concept of Sixth-Grade Male Students in Iranshahr

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A B S T R A C T

Purpose: The present study aimed to determine the effectiveness of group problem-solving skills training on academic achievement motivation and academic self-concept of sixth-grade male students in Iranshahr.

Methods and Materials: The statistical population of this quasi-experimental study included all sixth-grade male students in Iranshahr during the 2023-2022 academic year. Forty children who met the inclusion criteria were selected as the sample using multistage cluster sampling and were randomly assigned equally to an experimental group and a control group. The experimental group participated in an educational program on problem-solving strategies across 8 sessions, while the control group remained on a waiting list without receiving any training during this period. The primary data of this study were collected using Hermans' Academic Achievement Motivation Questionnaire (1977) and Yessen-Chi's Academic Self-Concept Questionnaire (2004). Data analysis was conducted in two parts: descriptive (central tendency and dispersion indices, skewness, and kurtosis) and inferential (multivariate analysis of covariance - MANCOVA) using SPSS-23 software.

Findings: The results showed that group problem-solving skills training is effective in improving academic achievement motivation and academic self-concept among sixth-grade male students in Iranshahr.

Conclusion: The findings of this study, in line with other research, confirm the efficacy of cognitive problem-solving interventions in enhancing academic achievement motivation and academic self-concept among students. Finally, the necessity of incorporating problem-solving skills training as part of school curricula and its impact on student behaviors and academic performance was discussed.

Keywords: *Problem-Solving Skills, Academic Achievement Motivation, Academic Self-Concept*

1. Introduction

Undoubtedly, one of the signs of success for any individual in today's world is academic achievement (Enayati Shabkolai et al., 2023; Ofem et al., 2024). The progress and development of any country are directly related to its advancements in science, knowledge, and technology. Scientific progress can only be achieved when thoughtful and creative individuals are nurtured. Academic achievement refers to an individual's learned or acquired ability in school subjects, measured by standardized tests (Ghadampour et al., 2018). It has frequently been observed that students with very similar learning abilities and talents exhibit significant differences in academic achievement. This aspect of human behavior relates to the field of motivation. Motivation refers to the internal states of an organism that direct behavior toward a certain goal (Mardani et al., 2024). Therefore, motivation is an activating factor for human behavior and is one of the key elements that can significantly influence the level of academic achievement (Saif, 2023).

Achievement motivation can be driven by two distinct factors (Karaman & Watson, 2017): competition, which enhances learners' interest and effort to prove they possess better academic skills than their peers, and mastery, which involves a high commitment to mastering learned material, prioritizing intellectually challenging activities, and striving for perfection in executing them (Habibi et al., 2021). Academic achievement is highly important in educational settings as it reflects students' competence levels concerning academic content (Saif, 2023). Achievement motivation is an active topic in the field of education (Ahmed et al., 2020) and has a strong and meaningful relationship with students' academic success (Sharma et al., 2020). Self-concept is a key and significant concept in Bandura's social cognitive theory (Galla et al., 2014).

Over the past two decades, a crucial motivational behavior impacting academic achievement has been self-concept, which is a general concept referring to an individual's perceptions of their abilities, capabilities, and limitations (Cooper et al., 2018). One dimension of self-concept is academic self-concept, which refers to the mental representations of an individual's abilities in school and academic settings or representations related to academic achievement. In other words, academic self-concept refers to an individual's self-assessment concerning specific academic domains and abilities (Eslami et al., 2020). Students with a low academic self-concept perceive themselves as less competent and capable, and such a negative perception of their abilities leads to negative emotions, including test anxiety in educational situations (Rastravesh & Mohammadi, 2020).

Since the progress and development of any society largely depend on the training of students as an efficient human resource capable of transforming the community's potential resources into actual achievements through dynamic thinking and high motivation (Rahmati-Keikha et al., 2021), it is necessary to implement comprehensive and structured training programs throughout the academic year to improve the quality of education and strengthen these variables.

In this context, researchers have considered problem-solving skills training as one of the most influential educational strategies for increasing students' achievement motivation (Pinar et al., 2018). Problem-solving is an active learning method that includes five stages: identifying and defining the problem, gathering information, preliminary conclusions, testing results, and evaluating and decision-making (Saif, 2023). The focus of this training is not on finding a specific solution to a particular problem but rather on deriving an abstract principle or rule that can be generalized to other situations (Habibi, 2020). Gagne (1984) defined problem-solving as a process in which the learner integrates previously learned principles to solve new problems. Thus, problem-solving is not merely the application of learned principles but a process that facilitates new learning (Mahdavi et al., 2018).

In problem-solving skills training, the goal is not to find a particular solution for a specific issue. What matters is that the process of solving the problem results in the development of an abstract principle or rule that is transferable to other situations. As a result, the learning acquired from problem-solving is more transferable to new contexts compared to other types of learning (Soleimani et al., 2018; Zamani et al., 2017). Mahdavi et al. (2018) demonstrated that problem-solving skills training significantly improves students' adaptability and self-regulation strategies (Mahdavi et al., 2018). Zamani et al. (2017) stated that problem-solving skills training could be considered an intervention for reducing students' anxiety (Zamani et al., 2017). Additionally, studies have shown a significant correlation between problem-solving strategies, achievement motivation, and self-esteem among students (Pakarinen & Kikas, 2019; Pinar et al., 2018).

A review of previous research indicates that while substantial research has been conducted on the variables

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under study, fewer studies have examined the impact of problem-solving skills strategies on academic self-concept, with most research focusing on general self-efficacy rather than academic self-efficacy. Additionally, studies involving problem-solving skills and achievement motivation are more relational in nature rather than effectiveness studies. Moreover, from a population perspective, the researcher's review of previous research suggests that most studies have focused on high school students, with fewer studies examining primary and elementary school students. These factors underscore the necessity of conducting this research. Given this and the fact that no previous study has investigated the effectiveness of group problem-solving skills training on achievement motivation and academic self-concept, the primary research question is: Does group problem-solving skills training affect the academic achievement motivation and academic self-concept of sixth-grade male students in Iranshahr?

2. Methods and Materials

2.1. Study Design and Participants

The research method used in this study is quasi-experimental, employing a pretest-posttest design with a control group and follow-up. The sample consisted of one experimental group and one control group. The statistical population included all sixth-grade male students in primary schools in Iranshahr during the 2023-2022 academic year. There were 17 urban boys' schools (4 schools in the north, 5 in the east, 4 in the west, and 4 in the south), with each school averaging 90 sixth-grade male students. From this population, 40 students were selected as the sample. The sampling method was multistage cluster sampling.

Initially, one of the four geographical regions of Iranshahr (the north) was randomly selected. From the boys' primary schools in this region, three schools (Sizdah Aban, Shahid Keshvari, and Shahid Sadooqi) were chosen randomly. The sixth-grade classes within these schools (3 classes with capacities ranging from 27 to 35 students) were then randomly sampled, based on inclusion and exclusion criteria (Inclusion criteria: being enrolled in sixth grade without academic failure, not having any chronic physical or mental illnesses, living with both parents (not being single-parented), being between 12 to 13 years old, giving informed consent to participate in the study, parental consent for their child's participation, and having an average IQ. Exclusion criteria: being absent from more than two sessions of the training, and lack of interest in continuing with group therapy sessions). Finally, 60 students were randomly assigned equally to the two groups (1 experimental group and 1 control group) through a lottery method. The experimental group received problem-solving skills training, while the control group did not receive any training.

2.2. Measures

2.2.1. Academic Achievement Motivation

Hermans developed this questionnaire in 1970 based on theoretical and empirical knowledge about the need for achievement and a review of related research literature. Initially, he prepared 92 items, later refining it to 29 items for the final version. Akbari (2007) examined the validity of the Academic Achievement Motivation test. Factor analysis revealed that Hermans' questionnaire comprises four main factors: self-confidence, diligence, perseverance, and future orientation, collectively explaining 40.27% of the total variance. The test-retest reliability of the questionnaire was reported as 0.74, and Cronbach's alpha coefficients for the subscales were 0.72 for self-confidence, 0.65 for perseverance, 0.60 for future orientation, and 0.57 for diligence (Mahdavi-Ghoravi et al., 2012).

2.2.2. Academic Self-Concept

Yessen-Chi developed this 15-item questionnaire in 2004 to assess students' academic self-concept. It measures self-image and self-concept across three levels: general self-concept (items 1, 3, 5, 12, 13), school self-concept (items 2, 4, 8, 9, 10, 11, 14, 15), and non-academic self-concept (items 6, 7). Responses are rated on a 4-point Likert scale from "strongly agree" (4) to "strongly disagree" (1), with a minimum score of 15 and a maximum score of 60. Content validity was confirmed by expert faculty members, and the overall reliability was reported by Afshari Zadeh et al. (2013) as 0.78. The reliability coefficients were 0.86 for general self-concept, 0.79 for school self-concept, and 0.89 for non-academic self-concept (Afshari Zadeh et al., 2013). In this study, the overall reliability, assessed using Cronbach's alpha, was 0.91.

2.3. Intervention

2.3.1. Problem-Solving Training

The group training program, based on the problem-solving skills model by Sullivan, Lockie, and Graf (2009), was conducted over 8 weekly 90-minute sessions for the

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experimental group (Aghaei & Saeedi, 2021; Ghadampour et al., 2018; Habibi, 2020; Mahdavi et al., 2018; Pouladi Rishehri & Rahmani, 2018; Soleimani et al., 2018; Zamani et al., 2017).

Session 1: Orientation, Goal Setting, and Group Familiarization

The first session focuses on introducing the group members to one another and establishing a sense of comfort within the group. The facilitator explains the structure, objectives, and rules of the sessions. The purpose of this initial meeting is to outline the training process, clarify the expectations, and set the groundwork for group interactions.

Session 2: Enhancing Problem Orientation

In this session, participants are introduced to the concept of problem-solving. They learn to define and articulate a problem clearly, gather all available information, distinguish facts from assumptions that require further investigation, break down the problem into manageable parts, and specify the real objectives they hope to achieve. Activities emphasize the importance of adopting a constructive and realistic approach to problem-solving.

Session 3: Precise Problem Definition

The focus of the third session is on the necessity of defining the problem more accurately and breaking down complex issues into simpler components. Participants learn how to prioritize the sub-problems and avoid setting unrealistic or overly ambitious goals. The session addresses the importance of clarifying ambiguous issues and setting achievable targets.

Session 4: Generating a List of Potential Solutions

In this session, the emphasis is on brainstorming as many potential solutions as possible without judging their feasibility or correctness. The goal is to encourage creative and uninhibited thinking, where the quantity of solutions is more important than their immediate practicality. Participants are guided to generate diverse ideas to expand their problem-solving repertoire.

Session 5: Evaluating Solutions and Selecting the Best One

Participants are taught to assess the usefulness of the solutions they generated in the previous session. The session focuses on comparing the solutions, predicting possible outcomes, and weighing them against each other. Students learn to select a solution that aligns with their values and is realistically implementable. Practical exercises are used to reinforce the evaluation and decision-making process.

Session 6: Decision-Making and Implementing the Chosen Solution

This session addresses how to handle conflicts and interpersonal disagreements constructively. Participants practice decision-making, compare solutions, and discuss the execution process. They are taught to anticipate the consequences of their chosen solution and understand the potential outcomes. Interpersonal skills are also emphasized to ensure effective implementation.

Session 7: Reviewing the Process

The seventh session involves a cognitive reorganization of the steps taught so far. The facilitator reviews and explains each stage of the problem-solving process, emphasizing the importance of evaluating the outcomes after a solution has been implemented. Participants are guided through a structured review of how the problem-solving steps can be applied practically.

Session 8: Comprehensive Review and Application

The final session provides a comprehensive review of all the material covered. Students are presented with an incomplete story and are asked to apply the problem-solving steps to resolve it. This review helps solidify their understanding and ensure retention of the skills. The story serves as a practical exercise, and the intervention concludes with a post-test to measure the effectiveness of the training.

2.4. Data Analysis

Data analysis was conducted in two parts: descriptive (central tendency and dispersion indices, skewness, and kurtosis) and inferential (multivariate analysis of covariance - MANCOVA) using SPSS-23 software.

3. Findings and Results

This section reports the means and standard deviations of scores on academic achievement motivation and academic self-concept across the pretest, posttest, and follow-up stages for the experimental and control groups.

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Table 1

Mean and Standard Deviation of Academic Achievement Motivation by Assessment Stage in Each Group

Group	Variable	Statistic	Pretest	Posttest	Follow-up
Problem-Solving Skills Training	Self-Confidence	Mean	14.45	21.10	20.15
		Standard Deviation	4.12	3.35	3.91
Control	Self-Confidence	Mean	14.95	14.75	16.25
		Standard Deviation	4.47	6.22	6.45
Problem-Solving Skills Training	Perseverance	Mean	16.15	19.35	18.95
		Standard Deviation	3.59	2.66	3.41
Control	Perseverance	Mean	15.95	15.15	15.75
		Standard Deviation	3.02	3.99	4.00
Problem-Solving Skills Training	Future Orientation	Mean	13.70	19.80	20.15
		Standard Deviation	3.26	3.09	2.13
Control	Future Orientation	Mean	12.65	11.85	12.50
		Standard Deviation	2.61	3.06	3.22
Problem-Solving Skills Training	Diligence	Mean	17.05	20.70	20.95
		Standard Deviation	3.56	2.79	2.76
Control	Diligence	Mean	15.95	15.00	16.25
		Standard Deviation	2.63	4.05	4.76
Problem-Solving Skills Training	General Self-Concept	Mean	7.90	12.80	13.15
		Standard Deviation	2.86	2.57	3.00
Control	General Self-Concept	Mean	7.70	7.40	8.45
		Standard Deviation	2.77	3.50	3.19
Problem-Solving Skills Training	School Self-Concept	Mean	14.00	17.10	17.70
		Standard Deviation	3.52	2.63	2.08
Control	School Self-Concept	Mean	12.80	11.80	13.10
		Standard Deviation	2.42	3.46	3.08
Problem-Solving Skills Training	Non-Academic Self-Concept	Mean	5.60	11.30	12.20
		Standard Deviation	3.15	2.62	2.14
Control	Non-Academic Self-Concept	Mean	5.10	4.00	5.50
		Standard Deviation	1.77	2.90	2.82

As observed, the mean scores in the experimental groups increased from the pretest to the posttest stage. According to the results in Table 1, problem-solving skills training effectively increased the components of academic achievement motivation. The mean scores of the experimental groups also show an increase from the pretest to the posttest stage, indicating the training's effectiveness in enhancing academic self-concept.

Table 2

Mixed ANOVA Test for Academic Achievement Motivation Scores Using Greenhouse-Geisser Criterion

Variable	Statistical Indicator (Factors)	SS	df	MS	F	Sig	Eta Squared
Self-Confidence	Within-Groups	1.31	230.69	23.37	0.001	0.38	1.31
	Interactive	1.31	183.43	18.58	0.001	0.33	1.31
	Between-Groups	1.00	316.88	5.38	0.03	0.12	1.00
Perseverance	Within-Groups	1.66	25.23	4.80	0.02	0.12	1.66
	Interactive	1.66	52.22	9.94	0.001	0.21	1.66
	Between-Groups	1.00	192.53	6.98	0.01	0.16	1.00
Future Orientation	Within-Groups	1.62	133.42	20.81	0.001	0.35	1.62
	Interactive	1.62	203.19	31.69	0.001	0.46	1.62
	Between-Groups	1.00	980.41	68.67	0.001	0.64	1.00
Diligence	Within-Groups	1.34	67.74	10.66	0.001	0.22	1.34
	Interactive	1.34	87.53	13.77	0.001	0.27	1.34
	Between-Groups	1.00	440.83	15.46	0.001	0.29	1.00

The results in Table 2 indicate that for within-group factors, the calculated F-value for the effect of stages (pretest, posttest, and follow-up) is significant at the 0.05 level for the components of academic achievement

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motivation (P < 0.05). Thus, there is a significant difference between the mean scores of academic achievement motivation components across the three stages (pretest, posttest, and follow-up). Bonferroni post hoc tests were conducted to examine the differences between means at various stages. The results showed significant differences between the pretest and posttest, as well as between the pretest and follow-up stages. However, no significant difference was found between the posttest and follow-up stages, indicating the stability of the improvements from posttest to follow-up. The F-value for the interaction effect between stages and groups is significant, indicating a difference in academic achievement motivation components between the problem-solving training and control groups (P < 0.05).

Table 3

Mixed ANOVA Test for Academic Self-Concept Scores Using Greenhouse-Geisser Criterion

Variable	Statistical Indicator (Factors)	SS	df	MS	F	Sig	Eta Squared
General Self-Concept	Within-Groups	1.92	102.73	29.99	0.001	0.44	1.92
	Interactive	1.92	83.02	24.24	0.001	0.39	1.92
	Between-Groups	1.00	353.63	17.37	0.001	0.31	1.00
School Self-Concept	Within-Groups	1.32	60.82	12.69	0.001	0.25	1.32
	Interactive	1.32	73.07	15.25	0.001	0.29	1.32
	Between-Groups	1.00	410.70	21.42	0.001	0.36	1.00
Non-Academic Self-Concept	Within-Groups	1.61	157.47	28.22	0.001	0.42	1.61
	Interactive	1.61	176.39	31.61	0.001	0.46	1.61
	Between-Groups	1.00	700.83	61.05	0.001	0.62	1.00

The results in Table 3 show that for within-group factors, the calculated F-value for the effect of stages (pretest, posttest, and follow-up) is significant at the 0.05 level for the components of academic self-concept (P < 0.05). Thus, there is a significant difference between the mean scores of academic self-concept components across the three stages. Bonferroni post hoc tests revealed significant differences between the pretest and posttest, as well as between the pretest and follow-up stages. However, there were no significant differences between the posttest and follow-up stages, indicating that the improvements in academic self-concept components were maintained over time. The interaction effect between stages and groups is also significant, showing a meaningful difference in academic self-concept components between the problem-solving training and control groups (P < 0.05). The between-group F-value is also significant, indicating a significant difference in the overall mean scores of academic self-concept components between the problem-solving training and control groups.

4. Discussion and Conclusion

The present study aimed to investigate the effectiveness of group problem-solving skills training on academic achievement motivation and academic self-concept of sixth-grade male students in Iranshahr. The results from the statistical analysis of the data showed that group problem-solving skills training is effective in enhancing students' academic achievement motivation. These findings are consistent with those of previous studies by Rahmati Keikha et al. (2021), Aghaei and Saeedi (2021), Yazdanian (2020), and Pouladi Reyshahri and Rahmahi (2018). According to Gagne (1984), problem-solving is a process in which learners combine previously acquired principles to solve new problems. Thus, problem-solving is not just about applying learned principles but is a process that fosters new learning (Mahdavi et al., 2018). In problem-solving skills training, finding a specific solution to a particular problem is not the main goal. What matters is that through solving a problem, an abstract principle or rule is developed that can be generalized to other situations. This is why learning gained from problem-solving has greater transferability to new contexts compared to other types of learning (Pakarinen & Kiukas, 2019). When individuals use problem-solving and resourceful strategies, their sense of competence and mastery in academic subjects is strengthened. Additionally, using problem-solving strategies increases individuals' beliefs in their abilities, enhancing their motivation to achieve, and instilling confidence that they can attain their desired outcomes. Furthermore, problem-solving skills training enables students to recognize their strengths and weaknesses, pursue their education and learning with higher confidence, and approach obstacles with greater perseverance and diligence rather than feeling weak or

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incapable. This makes them value their academic tasks and responsibilities more, leading to increased attention and effort. Consequently, this not only boosts their academic achievement but also significantly impacts their motivation to succeed (Habibi, 2020).

The results also showed that group problem-solving skills training is effective in improving students' academic self-concept. These findings are consistent with studies by Noviandari and Mursidi (2019). Problem-solving skills training raises students' awareness of their abilities and helps them value these abilities, thus increasing their academic motivation (Noviandari & Mursidi, 2019). Through rational and reflective decision-making, students develop a positive self-concept. Individuals with a better self-concept, who have favorable perceptions of themselves and their abilities, are more motivated. Problem-solving skills training also fosters a positive outlook on oneself and life (Azimi et al., 2016). By using problem-solving skills, students learn to make appropriate decisions, manage their emotions, thoughts, behaviors, and self-awareness. In essence, problem-solving training helps students to engage in problem-focused coping, correct their thoughts, and approach challenges positively. This positive thinking can change their perspective about themselves and others, increasing their self-esteem and enhancing their self-concept (Soleimani et al., 2018).

The study had several limitations, including being conducted in Iranshahr, which requires considering situational similarities and cultural differences when generalizing the results to other contexts. As the sample consisted solely of male students, caution should be taken when generalizing the findings to female students. Since the study focused only on sixth-grade elementary students, extending the findings to other educational levels should be done carefully. Therefore, it is suggested that problem-solving training be provided using various methods, such as visual aids and animations for younger children, and more formal training across all educational levels, given its positive impact on various academic dimensions. Moreover, incorporating problem-solving skills training as an extracurricular subject in the curriculum, especially in primary education, is recommended.

Authors' Contributions

All authors significantly contributed to this study.

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this study, to observe ethical considerations, participants were informed about the goals and importance of the research before the start of the interview and participated in the research with informed consent.

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