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Comparison of the Effectiveness of Knowledge Conceptualization and Mindfulness Training on Students' Self-Efficacy

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A B S T R A C T

Purpose: The purpose of this study was to compare the effectiveness of knowledge conceptualization training and mindfulness on students' self-efficacy.

Methodology: The research method was quasi-experimental, utilizing a pre-test and post-test design with a control group. From the population of tenth-grade female students in public high schools in District 2 of Hamadan, 90 students were selected using single-stage cluster sampling and were randomly assigned to three groups of 30 (two experimental groups and one control group). The experimental groups received either knowledge conceptualization training (7 sessions) or mindfulness training (8 sessions), while the control group continued with their regular classroom activities. The General Self-Efficacy Questionnaire (Schwarzer & Jerusalem, 1982) was used to measure the dependent variable. Data were analyzed using one-way analysis of covariance (ANCOVA).

Findings: The results indicated a significant difference in self-efficacy between the experimental groups (knowledge conceptualization and mindfulness) and the control group in the post-test stage after adjusting for pre-test scores. Moreover, knowledge conceptualization had a greater impact on students' self-efficacy compared to mindfulness training.

Conclusion: Based on the results of the present study, it can be concluded that educational-psychological interventions, including knowledge conceptualization and mindfulness, can enhance students' adaptation to academic situations and facilitate the achievement of educational goals.

Keywords: *Knowledge Conceptualization, Mindfulness, Self-Efficacy.*

1. Introduction

The growing complexity of modern education demands not only academic proficiency but also psychological resilience and adaptability among students. Within this context, the concepts of self-efficacy and mindfulness have emerged as pivotal factors influencing students' academic performance and overall well-being (Mahdian et al., 2021; Wang et al., 2024). Self-efficacy, defined as an individual's belief in their ability to achieve specific outcomes (Badawy, 2022; Rezeki, 2022), plays a critical role in shaping students' motivation, learning behaviors, and academic success (Asdolahzadeh et al., 2021; Firth-Clark et al., 2019; Ghorbani & Yazarloo, 2021; Sarkam et al., 2019). Mindfulness, on the other hand, refers to the state of being aware and present in the moment without judgment, and has been increasingly recognized for its potential to enhance cognitive functions, emotional regulation, and stress management in educational settings (Bishara, 2021; McConville et al., 2019; Shoghi et al., 2023).

Self-efficacy has long been regarded as a cornerstone of educational psychology. It influences students' choices, effort, persistence, and resilience when faced with challenges (Ganefri et al., 2021). High self-efficacy is associated with better academic performance, greater persistence in the face of difficulties, and a more proactive approach to learning (Firth et al., 2019). In contrast, low self-efficacy can lead to academic disengagement, anxiety, and a higher likelihood of dropping out (Wagner et al., 2013). Several studies have highlighted the importance of fostering self-efficacy among students to improve their academic outcomes and psychological well-being. For instance, Steyn et al. (2016) demonstrated that psychological skills training, including self-efficacy enhancement, significantly improved the psychological well-being and academic performance of undergraduate music students (Steyn et al., 2016).

The relationship between self-efficacy and academic performance is well-documented, with research indicating that students with higher self-efficacy tend to set higher goals, use more effective learning strategies, and demonstrate greater academic achievement (Setiawan et al., 2019; Yilmaz & Türk, 2020). Moreover, interventions aimed at boosting self-efficacy, such as goal-setting and self-regulation strategies, have been shown to lead to improved academic outcomes (Jackson et al., 2014; Spangler et al., 2014). In this regard, self-efficacy not only acts as a mediator between motivation and performance but also enhances students' capacity to overcome academic challenges (Xu et al., 2023).

Mindfulness has gained considerable attention in educational psychology due to its positive effects on students' cognitive and emotional functioning (Menges & Caltabiano, 2019). By fostering a heightened state of awareness and focus, mindfulness practices can help students manage stress, improve attention, and enhance overall academic performance (Gorvine et al., 2019). Mindfulness has also been linked to better emotional regulation, which is crucial for academic success, particularly in high-pressure environments such as schools and universities (Lesmana & Bidangan, 2021; Özcan, 2022).

Research has shown that mindfulness can positively impact self-efficacy by helping students develop a more balanced and non-judgmental approach to their experiences (Ebrahem et al., 2022; Lo et al., 2021). For example, mindfulness-based stress reduction (MBSR) programs have been found to improve self-efficacy and reduce stress levels among students (Miller et al., 2021). Furthermore, mindfulness training has been shown to enhance cognitive processes such as attention and memory, which are directly related to academic performance (Minkos et al., 2017). The integration of mindfulness practices into educational settings has the potential to not only improve academic outcomes but also promote students' psychological well-being (Sherman et al., 2022; Shokri et al., 2020).

The relationship between self-efficacy and mindfulness is synergistic, with each enhancing the other's effects on academic performance and psychological health. Mindfulness can bolster self-efficacy by reducing cognitive load and anxiety, thus allowing students to focus more effectively on their academic tasks (Bishara, 2021). This, in turn, can lead to higher levels of academic achievement and greater overall well-being (Firth-Clark et al., 2019). Conversely, students with high self-efficacy are more likely to engage in mindfulness practices, as they feel more confident in their ability to benefit from these techniques (Badawy, 2022; Sundling et al., 2016).

Several studies have explored the effectiveness of combining mindfulness training with interventions aimed at enhancing self-efficacy. For instance, McConville et al. (2019) found that mindfulness-based interventions led to significant improvements in both self-efficacy and academic performance among physiotherapy students. Similarly, Firth et al. (2019) demonstrated that mindfulness training, when combined with cognitive-behavioral strategies, significantly reduced stress and improved self-efficacy in student-

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athletes. These findings suggest that integrating mindfulness and self-efficacy training can create a powerful tool for enhancing student outcomes across various educational contexts (McConville et al., 2019).

Despite the growing body of research highlighting the benefits of self-efficacy and mindfulness in educational settings, there remains a need for further investigation into how these factors interact to influence student outcomes. Specifically, it is important to explore the comparative effectiveness of different educational interventions—such as knowledge conceptualization and mindfulness training—on students' self-efficacy. While previous research has demonstrated the positive effects of both mindfulness and self-efficacy on academic performance (Rezeki, 2022; Yan et al., 2022), less is known about how these interventions compare when applied to the same population.

This study aims to fill this gap by examining the effects of knowledge conceptualization and mindfulness training on the self-efficacy of high school students. The research is grounded in the hypothesis that both interventions will lead to significant improvements in self-efficacy, with knowledge conceptualization expected to have a more pronounced effect due to its direct focus on enhancing cognitive understanding and mastery of academic content.

2. Methods and Materials

2.1. Study Design and Participants

The research design utilized in this study was a quasi-experimental pre-test-post-test design with a control group. The study population included 1,205 tenth-grade female students enrolled in public high schools in District 2 of the Hamadan Department of Education during the 2023-2024 academic year. A sample of 90 students was selected using cluster sampling, where three schools with similar cultural, social, and economic backgrounds were chosen. From each school, one class was randomly selected as a cluster. Finally, 30 students from each class were randomly assigned to three groups: two experimental groups and one control group, with equal distribution. In support of the adequacy of the sample size for experimental research, Delavar (2014) recommended a minimum of 15 participants for each experimental and control group.

The inclusion criteria were: age range of 15 to 18 years, absence of any physical, psychological, or personality disorders, no concurrent psychological treatment, and a normal IQ score. The exclusion criteria included: withdrawal of the student or their parents from participation, participation in other psychological education or therapy, inability to continue due to physical or mental health reasons, and absence from more than two sessions.

After selecting the research sample, ethical considerations were addressed by explaining the study's objectives and importance to the parents, obtaining their full consent for their children's participation. Additionally, students were assured that the data collected would be analyzed in aggregate form and kept completely confidential. Initially, all participants completed the General Self-Efficacy Scale (GSES) as a pre-test in a group setting. The first experimental group then received 7 sessions of 2-hour knowledge conceptualization training, while the second experimental group underwent 8 sessions of 2-hour mindfulness training. Immediately after the 10-week training period, the self-efficacy post-test was administered to all three groups.

2.2. Measures

2.2.1. General Self-Efficacy

General Self-Efficacy Scale (GSES) consists of 17 items with 3 subscales, including the tendency to initiate behavior, persistence in completing behavior, and perseverance in the face of failure. The items are scored on a 5-point Likert scale. Items 3, 8, 9, 13, and 15 are reverse-scored. Therefore, the minimum score on this scale is 17, and the maximum score is 85. The questionnaire's reliability was reported by Schwarzer and Jerusalem (1982) with a Cronbach's alpha coefficient of 0.76. The validity of this questionnaire, measured by Guttman's split-half method, was reported to be 0.76, and the Cronbach's alpha coefficient was reported to be 0.79. In the present study by Davoodi et al. (2024), the Cronbach's alpha was reported to be 0.91 (Safikhani, 2022).

2.3. Interventions

2.3.1. Knowledge Conceptualization Training

To develop the educational package for knowledge conceptualization strategies, domestic and international sources were reviewed. The studies and theories most influential in teaching knowledge conceptualization strategies and aligning with its components were selected and included in the main headings of the educational package. To assess content validity, the package was initially reviewed by three educational psychology professors, who were asked to evaluate the educational approach and the content. After incorporating the experts' feedback, the

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package was piloted on 10 students. Following the identification of strengths and weaknesses, necessary revisions were made in consultation with specialists, and the finalized package was provided to the instructors, who conducted the training in 7 sessions of 2 hours each.

Session 1: Selection of Concept and Articulation of Educational Goals

In this session, we started by identifying and naming the concept or concepts that were to be taught to the students. The session involved establishing clear educational objectives related to these concepts to guide the subsequent sessions.

Session 2: Definition and Analysis of the Concept

Students were asked to identify the concept, list its key attributes, and write a brief definition. This session aimed to help students understand the fundamental aspects of the concept and set the groundwork for deeper learning.

Session 3: Determining Prerequisites for Conceptual Learning

In this session, students were taught the prerequisite concepts that are essential for understanding the primary concept. This included teaching related concepts, such as differentiation, to ensure that students could fully grasp the main concept.

Session 4: Providing Definitions and Examples of the Concept

After laying the foundation in the previous sessions, this session focused on delivering a clear definition of the concept and presenting various examples. These examples were designed to reinforce the concept and facilitate comprehension.

Session 5: Simultaneous Presentation of Multiple Examples

In this session, students were presented with multiple positive and negative examples of the concept simultaneously. This approach was intended to help students learn the concept more quickly and effectively by comparing and contrasting different instances.

Session 6: Providing Opportunities for Learner Responses and Reinforcing Correct Answers

During this session, feedback was collected from students based on their responses to questions about the learned concepts. This feedback was used to reinforce correct answers and clarify any misunderstandings, thereby enhancing the learning process.

Session 7: Evaluation of Student Learning

The final session involved an evaluation of the students' understanding of the concept. The teacher presented new positive and negative examples of the concept, different from those used in teaching, and asked students to identify which examples accurately represented the concept.

2.3.2. Mindfulness Training

To develop the mindfulness training package, domestic and international sources were reviewed. Studies and theories with the most impact on mindfulness strategies and overlapping with its components were selected and included in the main sections of the educational package. For content validity, the package was initially reviewed by three educational psychology professors, who were asked to evaluate the educational approach and the content. After incorporating expert opinions, the package was piloted on 10 students. Following the identification of strengths and weaknesses, necessary revisions were made in consultation with specialists, and the finalized package was provided to the instructors, who conducted the training in 8 sessions of 2 hours each.

Session 1: Pre-Test Administration, Establishing Rapport, and Introduction to Mindfulness

This session focused on administering the pre-test, establishing a connection with the participants, and introducing the concept of mindfulness. The aim was to create a comfortable learning environment and set the stage for the training.

Session 2: Progressive Muscle Relaxation for 14 Muscle Groups

Students were taught relaxation techniques for 14 muscle groups, including the forearms, upper arms, back of the legs, thighs, abdomen, chest, shoulders, neck, lips, jaw, eyes, and the upper and lower forehead. This session was designed to help students experience physical relaxation as a foundation for mindfulness.

Session 3: Progressive Muscle Relaxation for 6 Muscle Groups

In this session, students practiced relaxation techniques focused on 6 muscle groups: hands and arms, legs and thighs, abdomen and chest, neck and shoulders, jaw and lips, and forehead and eyes. The goal was to deepen their relaxation skills and prepare them for more advanced mindfulness practices.

Session 4: Mindful Breathing

Students were introduced to mindful breathing techniques, involving calm inhalation and exhalation without focusing on anything else. They were guided to

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observe their breath with closed eyes, promoting a deeper sense of awareness and relaxation.

Session 5: Body Scan Technique

This session introduced the body scan technique, a mindfulness practice that involves systematically focusing on different parts of the body. This technique helps students develop a greater awareness of bodily sensations and promotes relaxation.

Session 6: Mindfulness of Thoughts

Students were taught to observe their thoughts mindfully, without judgment or attachment. This session aimed to help students become more aware of their mental processes and develop the ability to manage their thoughts more effectively.

Session 7: Full Mindfulness Practice

In this session, students practiced full mindfulness, integrating all the techniques they had learned. The goal was to help them achieve a comprehensive state of mindfulness, encompassing both physical and mental awareness.

Session 8: Applying Mindfulness Techniques to Everyday Life and Post-Test Administration

2.4. Data Analysis

Following the post-test, the collected data were analyzed. Descriptive statistical indicators (mean and standard deviation) and inferential statistics (one-way analysis of covariance) were calculated using SPSS version 26.

3. Findings and Results

Descriptive statistics, including the mean and standard deviation of the research variables, are presented in Table 3.

Table 1

Means and Standard Deviations for Pre-Test and Post-Test Scores of Research Variables in Experimental and Control Groups

Variable	Group	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD
Academic Achievement Motivation	Experimental 1 (Knowledge Conceptualization)	59.83	4.38	73.10	4.99
	Experimental 2 (Mindfulness)	62.96	3.28	71.90	4.53
	Control	61.06	4.95	60.40	4.83

The results in Table 3 show that the mean and standard deviation of self-efficacy in the post-test phase increased compared to the pre-test phase in all experimental groups, while it decreased in the control group.

To compare the effects of the interventions on the dependent variable, a one-way analysis of covariance (ANCOVA) was used. Since this statistical method has certain assumptions, the important assumptions were examined first. One assumption is the normality of the distribution of the sample scores. In this study, the Kolmogorov-Smirnov test was used to assess the normality of the score distribution, confirming that the research variables were normally distributed in both the pre-test and post-test phases for all variables (P > .05). Additionally, the results of the homogeneity of regression slopes test for pre-test and post-test academic achievement motivation in the experimental and control groups showed that this assumption was met for all research variables (P > .05). Furthermore, Levene's test was used to examine the homogeneity of error variances, and the results indicated that this assumption was also met for the research variables (P > .05).

Given that the assumptions of ANCOVA were met, a one-way ANCOVA was conducted to compare the effects of knowledge conceptualization and mindfulness training on students' self-efficacy. The results are presented in Table 2.

Table 2

Results of One-Way ANCOVA for Comparing Experimental and Control Groups on Self-Efficacy in the Post-Test Phase

Variable	Source	Sum of Squares	df	Mean Square	F	Sig.	Effect Size
Self-Efficacy	Model	3479.24	5	695.84	39.78	.001	
	Pre-Test	471.06	1	471.06	26.93	.001	
	Group	3149.58	2	1574.79	86.22	.001	.64
	Error	1570.68	86	18.26			

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The results of the one-way ANCOVA (Table 4) showed that, considering the pre-test scores as a covariate, the effect of the group on students' self-efficacy was significant at the .01 level ($F_{(2,86)} = 86.22$, $P < .05$). Therefore, there was a significant difference among the three groups in terms of increased self-efficacy scores. Additionally, the effect size was found to be .64, indicating that 64% of the individual differences in self-efficacy were due to group membership (the impact of the interventions). Thus, there was a significant difference in self-efficacy between the experimental groups (knowledge conceptualization and mindfulness) and the control group in the post-test phase after adjusting for pre-test scores.

Table 3

Results of Bonferroni Post-Hoc Test for Comparing Adjusted Post-Test Means of Self-Efficacy in Experimental and Control Groups

Variable	Group I	Group J	Mean Difference	SE	Sig.
Self-Efficacy	Knowledge Conceptualization	Mindfulness	2.83	1.15	.049
		Control	13.80	1.13	.001
	Mindfulness	Knowledge Conceptualization	-2.83	1.15	.049
		Control	10.98	1.11	.001

The results of the Bonferroni post-hoc test (Table 3) show that there was a significant difference between the effects of knowledge conceptualization and mindfulness on self-efficacy. Specifically, knowledge conceptualization was significantly more effective than mindfulness in improving self-efficacy. The comparison of the experimental groups (knowledge conceptualization and mindfulness training) with the control group also showed significant differences in self-efficacy, indicating that both interventions had a positive impact on increasing self-efficacy.

4. Discussion and Conclusion

The findings of this study indicate that both knowledge conceptualization and mindfulness training significantly enhance students' self-efficacy, as evidenced by the improved post-test scores compared to the pre-test scores. However, the results also show that knowledge conceptualization had a more substantial impact on self-efficacy than mindfulness training. This suggests that while both interventions are effective in promoting self-efficacy, the direct focus on cognitive understanding and mastery of academic content in knowledge conceptualization may lead to greater improvements in students' belief in their academic abilities.

The significant effect of knowledge conceptualization on self-efficacy aligns with previous studies that have highlighted the importance of cognitive strategies in enhancing students' confidence in their academic performance. For example, Firth-Clark et al. (2019) found that cognitive-behavioral techniques significantly improved academic achievement and self-efficacy in student-athletes (Firth-Clark et al., 2019). Similarly, Yan et al. (2022) demonstrated that self-assessment mind maps, which are closely related to knowledge conceptualization, effectively boosted students' self-efficacy in creativity and learning performance (Yan et al., 2022). The current study's findings reinforce the notion that structured, content-focused interventions can have a profound impact on students' self-belief and motivation.

Mindfulness training also showed a significant positive effect on self-efficacy, although it was less pronounced than the effect of knowledge conceptualization. This result is consistent with previous research indicating that mindfulness can enhance self-efficacy by reducing cognitive load and anxiety, thereby allowing students to focus more effectively on their academic tasks (Bishara, 2021; Firth et al., 2019). The finding that mindfulness training was effective, albeit to a lesser degree, supports the idea that while mindfulness is beneficial for managing stress and enhancing emotional regulation, its impact on self-efficacy might be more indirect compared to interventions that target cognitive processes directly (Miller et al., 2021; Steyn et al., 2016).

The comparative effectiveness of these interventions highlights the importance of tailored educational strategies that address both cognitive and emotional aspects of learning. The significant difference in self-efficacy improvements between the two experimental groups suggests that combining these approaches could offer a more holistic solution, catering to the diverse needs of students. Previous studies have also suggested the benefits of integrating mindfulness with cognitive strategies to maximize educational outcomes (Gorvine et al., 2019; Rezeki, 2022). The current findings provide further evidence

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that such integrated approaches could be particularly effective in enhancing students' self-efficacy and, consequently, their academic performance.

Despite the valuable insights provided by this study, several limitations must be acknowledged. First, the study's quasi-experimental design, while robust, does not allow for the control of all potential confounding variables, such as students' prior experience with mindfulness or cognitive strategies. Additionally, the sample was limited to tenth-grade female students from a specific geographic region, which may limit the generalizability of the findings to other populations or educational contexts. Furthermore, the short duration of the interventions (seven and eight sessions, respectively) may not fully capture the long-term effects of these strategies on self-efficacy.

Future research should consider using a randomized controlled trial design to better control for confounding variables and to establish a more definitive causal relationship between the interventions and improvements in self-efficacy. Additionally, it would be beneficial to explore the long-term effects of both knowledge conceptualization and mindfulness training on self-efficacy by conducting follow-up assessments several months after the intervention. Expanding the sample to include students of different ages, genders, and from diverse geographic and socioeconomic backgrounds would also help to determine the generalizability of the findings. Furthermore, future studies could investigate the potential benefits of combining knowledge conceptualization and mindfulness training into a single, integrated intervention to assess whether this approach could yield even greater improvements in self-efficacy and academic performance.

Educators and school administrators should consider incorporating both knowledge conceptualization and mindfulness training into their teaching practices to enhance students' self-efficacy and academic outcomes. Given the greater impact of knowledge conceptualization observed in this study, it may be particularly beneficial to emphasize cognitive strategies that help students organize and understand academic content. However, mindfulness training should not be overlooked, as it plays a crucial role in reducing stress and improving emotional regulation, which are essential for maintaining long-term academic success. Schools could implement a combined program that offers both types of training, providing students with a comprehensive toolkit to support their academic and personal development. Additionally, ongoing teacher training on these interventions could help educators effectively integrate these practices into their classrooms, thereby fostering a more supportive and effective learning environment.

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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