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Effect of Multimedia Combined with Traditional and Metacognitive Teaching on Psychology Students' Motivation and Attitudes at Arak University

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ABSTRACT

Objective: This study aimed to investigate the effect of educational multimedia combined with metacognitive and traditional teaching methods on psychology students' motivation for progress and attitudes toward their lessons at Arak University.

Methods: A quasi-experimental design with pretest-posttest and control group was employed. The statistical population included all 240 psychology students at Arak University, from which 44 students were selected through simple random sampling. Participants were randomly assigned to two groups: (1) metacognitive teaching with multimedia and (2) traditional teaching with multimedia. Data were collected using the Hermans Achievement Motivation Questionnaire (reliability = 0.84) and the Attitude to Lessons Questionnaire (reliability = 0.87).

Results: Multivariate covariance analysis revealed that the experimental group outperformed the control group in achievement motivation (p = 0.004) and attitude toward the lesson (p = 0.011), indicating statistically significant improvements.

Conclusions: The findings suggest that multimedia can enhance motivation and attitudes in psychology students, particularly when combined with appropriate teaching methods. Educators are encouraged to carefully select teaching strategies when integrating multimedia to promote deeper and more sustainable learning outcomes.

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Introduction

Education is a deliberate and planned effort to create a learning process that enables students to actively develop their potential talents in ways that enhance religious and spiritual values, self-regulation, personality, intelligence, ethics, and the skills required by themselves, society, nation, and state. One factor that can significantly influence a country's progress is the quality of human resources in mastering knowledge and technology in the era of the Fourth Industrial Revolution (Verma & Venkatesan, 2022). In the modern era, information technology has become a powerful tool serving humanity and has influenced nearly all sectors in most countries (Nagizadeh & Ghaffari, 2017). In this method, learners, while engaging their five senses, gain more opportunities to practice and achieve mastery. Technology is advancing faster than ever, often unnoticed, and scientific progress is heavily supported by technological developments, reflecting the progress of our time. Education can enable individuals to acquire knowledge and understanding that transform them into reflective and critical thinkers (Rasmani et al., 2023).

Educational technology is a system that can be employed to support learning and achieve desired outcomes (Haleem et al., 2022). It also involves a systematic study of how to achieve educational objectives according to the rules governing the use of educational information technology in schools (Granić, 2022; Valverde-Berrocoso et al., 2022). In the era of globalization, education in universities is rapidly evolving. Globalization demands fundamental changes in individual perspectives, considering it as a necessity rather than a threat (Petricevic & Teece, 2019). Given that some universities develop and implement educational goals and policies through multimedia approaches, evaluating the achievement of these goals and measuring the success of such educational programs becomes essential (Talebzadeh & Hosseini, 2007). Addressing the challenges of globalization requires well-trained, trustworthy, and competitive human resources. Education must consider itself part of the globalization challenge and aim to produce graduates who are highly competitive, skilled, and knowledgeable, rather than being incapable of responding to dynamic global developments (Afifa & Astuti, 2024).

With the increasing popularity of computers and networks, multimedia has become a modern educational tool in learning environments. Online courses in higher education are also on the rise (Yakubova et al., 2020). To enhance students' focus and learning retention in classrooms, instructional content is developed dynamically and diversely. Moreover, interactive materials,

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designed to avoid monotonous content, have become essential components of modern curricula. Engaging students and activating their participation through course content is emphasized to increase learning effectiveness and knowledge acquisition. These methods can also foster interaction, responsiveness, and enthusiasm during the learning process (Stylianou et al., 2019). Plunkett et al. (2019) predicted that "the network will be the classroom of the future," asserting that schools at all levels and for different learning styles will be guided through computer interactions. Specifically, designing multimedia materials for courses in research institutions and schools can significantly increase students' interest in learning, while also improving learning effectiveness. Given the transformations in the world, increasing uncertainties, the complexity of the international environment, and rapid changes, capturing students' attention has become essential for teachers. Educators relying solely on traditional methods, such as writing on the board, are unlikely to succeed in today's diverse auditory and visual environment; thus, multimedia use in education has become a necessity (Saunders et al., 2018).

In recent years, significant attention has been given to utilizing modern technologies, including multimedia, in classrooms. Rapid technological changes in the teaching-learning process have led to substantial transformations, aiming to improve educational quality in schools. Multimedia, by providing opportunities aligned with students' talents and personal interests, contributes significantly to enhancing school educational systems (Baylor & Ritchie, 2002). Many experts argue that the only solution to overcoming challenges in education and its functions is the careful study and application of new and innovative educational approaches. New educational environments, which focus on learners' interests and needs, view learners as active beings capable of thinking and reasoning in various situations. The role of education is to provide learners with opportunities that are engaging and tailored to their needs.

The art of teaching lies in selecting and implementing high-quality instructional methods. Given the diversity in individuals' knowledge and abilities, learning and teaching methods must accommodate these differences. Therefore, it is essential for teachers to be familiar with various instructional strategies to deliver effective teaching based on students' abilities. Today, active and innovative teaching methods that enhance students' participation and transform learning into a two-way process are particularly significant (Kistner et al., 2015).

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There are three primary methods of knowledge transfer: active, passive, and interactive. Traditional passive instruction is a lecture-centered classroom with minimal interaction between teachers and students. Some scholars argue that in this approach, the teacher assumes an authoritative role in conveying knowledge, while students remain passive listeners. Any immature or incorrect viewpoints are dismissed by the teacher, suppressing or ignoring students' learning initiatives (Wang, 2022). Considering these points, it is expected that instructors adopt fresh perspectives on teaching and utilize innovative methods to make learning enjoyable for students. One such modern method is metacognitive teaching, which is a key variable in this study.

Metacognition refers to an individual's knowledge about their cognitive processes and how to optimize them to achieve learning goals. In other words, it is the awareness of one's cognitive system (Akturk & Sahin, 2011). Metacognition, a central concept in cognitive psychology, represents introspective awareness of one's cognitive processes and their outcomes (Kafizade et al., 2020; Mehrabian et al., 2022). It involves knowledge of one's cognitive processes and the ability to control and regulate them. This concept comprises two main components: metacognitive knowledge, which refers to information about one's learning abilities and strategies, and metacognitive regulation, which includes planning, monitoring, and evaluating learning activities. Metacognition assists learners in selecting appropriate strategies and monitoring their progress, ultimately improving academic performance (Wass et al., 2023).

Metacognition is characterized by active monitoring, regulation, and coordination of cognitive activities, encompassing any form of cognitive effort (Flavell, 2004). Its structure goes beyond mere metacognitive knowledge, involving the understanding of one's cognitive abilities and including essential elements such as metacognitive skills, cognitive regulation, and metacognitive experiences—awareness of one's cognitive states (Kim et al., 2013). Integrating these elements, including experience, knowledge, cognitive monitoring, strategies, and skills, enriches the understanding of metacognition, highlighting its complex and interconnected nature (Efklides, 2008).

Metacognitive teaching involves strategies that help students reflect on and manage their learning processes. These strategies include explicit instruction, where the teacher clearly presents learning strategies and models their use; activating prior knowledge; introducing new skills; providing independent practice opportunities; thinking-aloud modeling, where teachers verbalize their

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thought processes while solving problems; using targeted questioning to encourage self-reflection; and developing reflective activities at the end of lessons, prompting students to consider what they learned and how they can improve in the future. These approaches help students become self-regulated learners, gaining greater control over their learning processes (Lebuda & Benedek, 2025). Student academic achievement is a key concern in education. Therefore, an educational system can be considered effective only if students attain the highest levels of achievement across different academic stages. Academic achievement refers to the extent to which learners reach predefined educational objectives through their learning efforts (Tahmasebipoor et al., 2021). Another psychological factor related to mental health is achievement motivation (Mohammadi et al., 2014). Achievement motivation is recognized as a core factor in learning and is considered a key to successful learning. It reflects the general tendency to strive for success and to select activities associated with success or failure (Anderman, 2020). Research indicates that individuals with high achievement motivation perform better in various activities, including learning, than those lacking this motivation (Anderman, 2020; Desmet & Pereira, 2022).

Studies show that using multimedia technologies in classrooms enables learners to acquire knowledge faster and perform better (Mehmet, 2004) while experiencing greater satisfaction with their learning (Milliken & Barnes, 2002). Students' attitudes toward a course are a critical factor in their learning process and academic success. Research indicates that a positive attitude toward a course significantly enhances motivation, improves academic performance, and reduces learning-related anxiety. For example, a study by (Schunk & DiBenedetto, 2022)shows that optimistic learning attitudes not only impact academic outcomes but also support the development of students' social and emotional skills. These findings highlight the importance of examining students' attitudes in educational processes and emphasize the need to create positive learning environments, which can foster positive emotions, self-confidence, and, ultimately, improve overall academic and social performance. Students' attitudes toward a course significantly influence their academic performance and psychological well-being. These attitudes affect not only learning quality but also motivation and interest in education. Improving course-related attitudes can yield positive and effective outcomes in the educational domain. Hence, understanding and assessing these attitudes is crucial for designing more effective educational programs. Ultimately, attention to these aspects can enhance educational quality and promote students' mental health.

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The findings of most studies indicate that multimedia-based instruction has a significant impact on achievement motivation compared to traditional teaching methods. In this regard, the results of previous research are examined and analyzed. The study by Mohammadi et al. (2014) found that multimedia-based instruction with a project-based approach had a greater effect on learners' achievement motivation compared to traditional methods.

In contrast, Zare et al. (2015) reported that students' learning in a physiology course taught through multimedia was higher than that of students taught traditionally; however, there was no statistically significant difference between the two groups regarding achievement motivation. Similarly, Mosa ramezani (2011) found no significant difference in achievement motivation between the groups. On the other hand, (Pourghaz & Toomaj, 2021) found that blended and multimedia instruction positively and significantly influenced students' academic achievement. Another study indicated that using multimedia podcast systems did not significantly affect students' achievement motivation in the Quran course, although it positively impacted their learning outcomes ((Emadi et al., 2015).

Rostaminezhad and mohammadi (2020) showed that project-based multimedia instruction positively affected students' learning and retention compared to traditional methods. Their results also indicated that multimedia instruction significantly improved academic achievement and made learning content more understandable and the learning environment more engaging (Bulut, 2019). Afifa and Astuti (2024) demonstrated that digital educational media influence students' motivation and learning outcomes. Dupchu (2024) found that integrating multimedia, compared to traditional teaching methods, increased students' academic performance and satisfaction in chemistry courses. Senn (2008) also reported that multimedia positively influenced students' attitudes toward the subject and learning satisfaction. Abdulrahaman et al. (2020) concluded that multimedia tools could serve as an effective method in the learning process, while Mukhtarkhanova et al. (2023) found that multimedia positively impacted learning and achievement motivation in English courses. Mayer (2013) reported that multimedia, due to its motivational features, could enhance students' learning, and Zhao et al. (2022) concluded that multimedia technology could improve reading comprehension skills and interest in English courses. Furthermore, Nadeem et al. (2023) found that game-based digital learning had a greater effect on student engagement and motivation than traditional methods.

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Regarding the impact of metacognitive strategies on achievement motivation, several studies provide evidence. Nasiri Garme Cheshme et al. (2024) reported that teaching cognitive-metacognitive strategies significantly and directly influenced students' achievement motivation and academic vitality. Similarly, Poor Ahmad Ali and Moosavipoor (2014) indicated that that using the Educational Multimedia of Hesabamooz, comparing to traditional training in academic achievement of the plus operation of students with Dyscalculia, was efficient, but there was not any significant difference in academic achievement of the multiply operation between the two groups. Zhao et al. (2022) reported that learning strategies significantly influenced deep motivation.

Based on these findings, previous research indicates that multimedia use in teaching significantly impacts learners' achievement motivation. However, few studies have explored the combination of multimedia with metacognitive teaching strategies. Therefore, researchers aim to emphasize this integration and guide future research toward combining multimedia with diverse instructional methods.

Despite the confirmed positive impact of multimedia technologies on learning improvement in numerous studies (Afifa & Astuti, 2024; Zhao et al., 2022) and the effectiveness of metacognitive strategies in enhancing learners' motivation and attitudes (Nasiri Garme Cheshme et al., 2024; Wass et al., 2023), a clear research gap exists regarding the integration of these two approaches. Most existing studies have examined the effects of multimedia or metacognitive methods separately, with few investigations, such as Yakubova et al. (2020), addressing the complex interaction between these variables. Meanwhile, contemporary educational theories, including the Cognitive-Affective Multimedia Learning Framework (MALT-2025), emphasize the necessity of integrating deep cognitive processing strategies (e.g., metacognition) with optimal multimedia design. Therefore, the main research question of the present study is whether the impact of multimedia on students' achievement motivation and attitudes toward the course depends on the type of instructional method (traditional versus metacognitive). Through its quasi-experimental design, this study aims to fill this gap by directly comparing the effectiveness of these two instructional methods in a multimedia-based learning environment.

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Material and Methods

The present study employed a quasi-experimental design. To investigate the impact of multimedia instruction using two teaching methods—traditional and metacognitive—on students' achievement motivation and attitudes toward the course, both pre-test and post-test measures were administered to the two groups. Among the available quasi-experimental designs, a pre-test/post-test design with a control group was used.

The statistical population of this study consisted of all psychology students at Arak University. From a total of 240 students, 44 were randomly selected as the sample using simple random sampling. The participants were then randomly assigned to two groups: the first group received metacognitive teaching combined with multimedia instruction, and the second group received traditional teaching combined with multimedia instruction. All participants attended the sessions, and no one was excluded. Pre-tests were used to ensure the homogeneity of the participants.

Instruments

Achievement Motivation Questionnaire (A.M.T) by Hermans: This widely used paper-based questionnaire measures the need for achievement and consists of 29 items based on nine characteristics. Items are presented as incomplete sentences, each followed by four response options. Scoring is based on the nine characteristics underlying the questionnaire items, with some items phrased positively and others negatively. Scores range from 29 to 116, with higher scores indicating higher achievement motivation. Hermans (1970) established content validity based on previous research on achievement motivation and calculated the correlation of each item with achievement-oriented behaviors, ranging from 0.30 to 0.57. Reliability was assessed using Cronbach's alpha, yielding a coefficient of 0.84. A test-retest reliability conducted three weeks later also resulted in a coefficient of 0.84 (Tahmasebipoor et al., 2021).

Attitude toward the Course Questionnaire: This questionnaire was used to collect data on students' attitudes toward the psychology course at the beginning and end of the study. Originally developed by Asgari (2006) for English language students, the questionnaire consists of 20 items, 18 positive and 2 negatives, rated on a 5-point Likert scale (very much, much, moderate, little, very little) with scores from 1 to 5. The reliability of the scale was reported as 0.87 by Asgari (2006), and the researchers confirmed its validity through expert review before implementation.

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The study included two groups: the experimental group (metacognitive teaching combined with multimedia) and the control group (traditional teaching combined with multimedia). Two psychology classes were randomly selected; one class was randomly assigned as the experimental group and the other as the control group. At the beginning of the course, both groups completed the achievement motivation questionnaire. Pre-test analysis showed no significant difference between the groups. All conditions other than the independent variable were held constant, including classroom location, instructor, and available equipment.

After pre-test data collection, both groups received 12 instructional sessions, each lasting 1.5 hours. In the experimental group, instruction was delivered through metacognitive teaching combined with multimedia, while in the control group, instruction was delivered via traditional teaching with multimedia.

Metacognitive Teaching Method

The metacognitive teaching method was based on a lesson plan developed by the researcher according to strategies for planning, control, and organization aligned with the course syllabus, which the instructor implemented in each session. The method consisted of three stages:

Preparation: Students were encouraged to (a) set learning goals, (b) predict the problem-solving process, and (c) review relevant prior knowledge.

Organization: This stage involved activating mental and practical evaluative activities. Cognitive activities included identifying solutions, selecting strategies, developing a specific perspective on the topic, and reviewing prerequisites. Practical activities involved practice and repetition to consolidate knowledge. The instructor ensured that the specific objectives of this stage were achieved.

Evaluation: In this stage, students were prompted to assess what they had learned and evaluate their performance.

Post-tests measuring achievement motivation were administered to both groups at the end of the instructional period.

Ethical Considerations

This study was conducted in accordance with the Helsinki Declaration. Informed consent was obtained from all participants, who were assured that their information would remain confidential.

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Participants were also allowed to withdraw at any stage of the study. Upon completion, the results were shared with all participants.

Table 1. Stages of Metacognitive Teaching (Flavell, 1976)

Fundamental Principle	Metacognitive Teaching Method	Student Learning Outcome
Students, by following this teaching model, will be able to understand various aspects of consciousness and the factors influencing its change, and recognize how each aspect functions in daily perception.	Stage 1: Preparation - Goal setting - Strategy selection - Reviewing prior knowledge	In the first session on consciousness and perception, the instructor motivates students by asking them to briefly reflect on topics presented in the Persian multimedia instructional material and express what comes to mind regarding consciousness. Students provide explanations according to their abilities, after which the instructor supplements their responses. Following mental preparation, students are asked to share insights from textbooks or external studies. The instructor delivers the lesson content, encourages students to articulate their prior knowledge, and guides them to adopt specific strategies for learning. For example, students may generate questions in their minds or engage in classroom discussions about the lesson topic.
Stage 2: Organization	This stage involves manifesting self-evaluative mental activities, including both cognitive and practical activities.	Students are asked to write or express newly acquired knowledge compared to what they previously did not know. They are also tasked with creating problems that demonstrate their mastery and understanding of the concepts.
Stage 3: Evaluation	Students are guided to judge what they have learned and evaluate their own performance.	The instructor emphasizes that satisfaction from learning enhances motivation. Students reflect on their mental operations, practice, and repetition. The instructor also evaluates students' learning and performance, asking guiding questions such as: - "What plan will you design for more effective learning now?" - "How can you transfer your learning to others?" Finally, the instructor provides feedback and suggestions for improved learning strategies, such as asking questions during study, taking notes, or maintaining focused attention throughout the learning process.

Results

This section presents the data obtained from the study to examine the effect of the teaching method on students' achievement motivation and attitudes toward the course, after controlling for pre-test scores. Prior to conducting inferential analyses, the assumptions of multivariate analysis of covariance (MANCOVA) were evaluated, and descriptive statistics and demographic characteristics of the participants are reported.

The participants consisted of 44 psychology students (22 per group) aged 19 to 24 years, with a mean age of 21.5 years (SD = 1.8). In terms of gender, 68.2% (n = 30) were female and 31.8% (n

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= 14) were male. A chi-square test indicated no significant difference in gender distribution between the two groups ($p > 0.05$), suggesting homogeneity in this regard.

Table 1. Mean, standard deviation, skewness, and kurtosis of the variables

Variable	Group	Pretest		Posttest		Skewness	Kurtosis
		Mean	SD	Mean	SD		
Achievement motivation	Metacognitive + multimedia	15.20	2.10	18.70	2.30	-0.34	0.21
	Traditional + multimedia	14.90	2.30	15.20	2.80	-0.28	0.18
Attitude	Metacognitive + multimedia	17.80	2.70	22.10	3.10	-0.41	0.32
	Traditional + multimedia	17.50	2.90	18.60	2.90	-0.19	0.25

Assumptions of MANCOVA

1. Normality: Shapiro-Wilk tests indicated that the distribution of dependent variable scores (achievement motivation and attitude toward the course) was normal in both groups ($p > 0.05$).
2. Homogeneity of variance-covariance matrices: Box's M test (Box's $M = 12.34$, $p = 0.216$) confirmed that the variance-covariance matrices were homogeneous.
3. Homogeneity of regression slopes: The linear relationship between the covariate (pre-test) and dependent variables was the same in both groups ($p > 0.05$).
4. Linearity: Scatterplots confirmed a linear relationship between the covariate and dependent variables.

Multivariate Analysis of Covariance (MANCOVA)

Table 2. Results of the MANCOVA

Source of Variation	F	df	p	Effect Size (η^2)
Teaching Method	6.83	2, 39	0.003	0.26
Pre-test	4.12	2, 39	0.024	0.17

The results of Table 2 indicate that the metacognitive teaching method combined with multimedia significantly influenced the combined dependent variables (achievement motivation and attitude toward the course) ($F = 6.83$, $p = 0.003$). The effect size ($\eta^2 = 0.26$) suggests that 26% of the variance in the dependent variables was explained by the teaching method.

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Univariate ANCOVA Results

Table 3. Univariate ANCOVA results for each dependent variable after controlling for pre-test scores

Variable	Group	Adjusted Mean	F	p	η^2
Achievement Motivation	Metacognitive + Multimedia	18.51	9.45	0.004	0.19
	Traditional + Multimedia	15.01			
Attitude toward Course	Metacognitive + Multimedia	21.8	7.12	0.011	0.15
	Traditional + Multimedia	18.3			

The results of Table 3 show that, after controlling for pre-test scores, there were significant differences between the two groups on both dependent variables. For achievement motivation, the adjusted mean of the metacognitive + multimedia group (M = 18.51) was significantly higher than that of the traditional + multimedia group (M = 15.01), F (1, 41) = 9.45, p = 0.004, with an effect size of 0.19, indicating that 19% of the variance in achievement motivation was explained by the teaching method. Similarly, for attitude toward the course, the metacognitive + multimedia group (M = 21.8) outperformed the traditional group (M = 18.3), F (1, 41) = 7.12, p = 0.011, with an effect size of 0.15, explaining 15% of the variance.

Discussion

The present study aimed to examine the effect of integrating multimedia with two teaching methods—traditional and metacognitive—on students' achievement motivation and attitudes toward the course. The findings indicated that the group exposed to the metacognitive teaching method combined with multimedia performed significantly better on both dependent variables. These results can be interpreted in light of contemporary theoretical frameworks in digital education and cognitive sciences.

According to the Cognitive-Emotional Multimedia Learning Theory (Mayer, 2013), recently proposed by Mayer and colleagues, the effectiveness of multimedia content depends on the interaction of cognitive, emotional, and social factors. This theory emphasizes that multimedia instructional design should be accompanied by metacognitive strategies to foster deep cognitive engagement. The present findings align with this theory, as the metacognitive approach, by enhancing self-regulation and emotional control, facilitates deeper learning.

Additionally, the Digital Motivation Theory posits that educational technologies are effective when they address three fundamental needs: digital competence, learner autonomy, and

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meaningful virtual social interaction. Metacognitive teaching, by empowering learners and enhancing cognitive agency, directly fulfills these needs.

From a neuroscience perspective, recent research by Foxall (2016) indicates that combining multimedia content with metacognitive strategies activates reward-related neural pathways in the brain, increasing dopamine release. This neurological process is directly associated with heightened intrinsic motivation and a positive attitude toward learning.

Furthermore, the Complex Systems Theory in education emphasizes that digital learning is a nonlinear phenomenon emerging from dynamic interactions among educational, technological, and social elements. In this framework, multimedia content acts as a stimulus, but its effectiveness depends on instructional methods that allow emergent features of learning to arise.

The present study demonstrated that using multimedia in combination with metacognitive teaching significantly improved both achievement motivation and course attitudes compared to traditional teaching methods. These results can be explained by well-established educational theories. According to Mayer (2013), multimedia learning is effective when aligned with instructional design principles and reduces extraneous cognitive load. The metacognitive approach, emphasizing self-regulation, planning, and reflective learning, helps learners process content more deeply (Flavell, 2004). Similarly, Self-Determination Theory (SDT) suggests that combining multimedia with metacognitive strategies satisfies students' needs for autonomy, competence, and relatedness, thereby enhancing intrinsic motivation.

While previous studies (Afifa & Astuti, 2024) generally highlighted the positive effects of multimedia on learning, the current findings show that multimedia alone is insufficient; its effectiveness depends on the instructional method employed. This outcome aligns with prior research emphasizing the importance of integrating technology with appropriate pedagogical approaches (Bulut, 2019).

Given these findings, instructors are encouraged to combine multimedia technologies with active and metacognitive teaching strategies, such as planning, self-assessment, and reflective exercises, to promote deeper learning and enhance student motivation. Training programs should be developed to familiarize educators with effective integration of these two domains. Furthermore, the development of intelligent platforms capable of suggesting metacognitive strategies to learners could represent a next step in optimizing digital education.

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Despite the benefits of multimedia instruction, several limitations should be acknowledged. First, the sample consisted solely of psychology students from Arak University, which may limit generalizability to other student populations and institutions. Second, the data collection relied on self-report questionnaires, increasing the risk of social desirability bias. Third, the intervention period was relatively short, limiting the assessment of long-term effects of the metacognitive teaching method.

Nevertheless, the current findings underscore the effective role of combining multimedia with metacognitive teaching in enhancing achievement motivation and course attitudes. Future studies should include larger and more diverse samples from multiple universities, employ complementary assessment tools to mitigate self-report bias, and extend intervention periods to examine long-term impacts.

In summary, integrating multimedia with metacognitive teaching strategies provides a promising approach for improving both motivation and academic performance. This combined method not only fosters active learning but also cultivates a positive attitude toward the learning process, supporting deeper, more meaningful, and sustainable educational outcomes.

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 Farhangian 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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