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Impact of the SCAMPER Program on the Acquisition and Retention of Physical Education Teaching Method Concepts and the Development of Creative Thinking Skills

Dampak Program SCAMPER terhadap Perolehan dan Retensi Konsep Metode Pengajaran Pendidikan Jasmani dan Pengembangan Keterampilan Berpikir Kreatif

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ABSTRACT

This study investigates the impact of the SCAMPER instructional program on third-year students' comprehension and long-term retention of concepts related to teaching methods in physical education, as well as its influence on the enhancement of creative thinking skills. The research was conducted within the College of Physical Education and Sports Sciences at the University of Mosul during the 2022–2023 academic year. The study population included all third-year students enrolled in the college, from which a randomized sample of 53 students was selected, specifically from sections C and D. Section C served as the experimental group, while section D functioned as the control group. Prior to the intervention, statistical procedures confirmed the equivalence and homogeneity of both groups in variables relevant to the experimental conditions. An experimental methodology was employed, utilizing a pretest-posttest design with equivalent groups to evaluate the outcomes of the intervention. The SCAMPER-based instructional program was implemented over a six-week period, incorporating a range of educational activities structured around the SCAMPER model (Substitute, Combine, Adapt, Modify, Put to Other uses, Eliminate, Reverse). Key findings of the study included the following: (1) The SCAMPER program, when integrated with educational technology, significantly enhanced students' acquisition of physical education teaching concepts, (2) The program also positively affected the retention of these concepts over time, (3) The intervention contributed to the development of core components of creative thinking among the participants.

Keywords: SCAMPER Program, Physical Education, Teaching Method Concepts, Creative Thinking.

ABSTRAK

Penelitian ini menyelidiki dampak program pembelajaran SCAMPER terhadap pemahaman siswa tahun ketiga dan retensi konsep jangka panjang yang berkaitan dengan metode pengajaran dalam pendidikan jasmani, serta pengaruhnya terhadap peningkatan keterampilan berpikir kreatif. Penelitian tersebut dilakukan di lingkungan Sekolah Tinggi Pendidikan Jasmani dan Ilmu Olah Raga Universitas Mosul pada tahun ajaran 2022–2023. Populasi penelitian mencakup seluruh siswa tahun ketiga yang terdaftar di perguruan tinggi, dari mana sampel acak sebanyak 53 siswa dipilih, khususnya dari bagian C dan D. Bagian C berfungsi sebagai kelompok eksperimen, sedangkan bagian D

berfungsi sebagai kelompok kontrol. Sebelum intervensi, prosedur statistik memastikan kesetaraan dan homogenitas kedua kelompok dalam variabel yang relevan dengan kondisi eksperimen.Metodologi eksperimental digunakan, memanfaatkan desain pretest-posttest dengan kelompok setara untuk mengevaluasi hasil intervensi. Program pengajaran berbasis SCAMPER dilaksanakan selama periode enam minggu, menggabungkan berbagai kegiatan pendidikan yang terstruktur berdasarkan model SCAMPER (Pengganti, Penggabungan, Adaptasi, Modifikasi, Penggunaan Lain, Penghapusan, Pembalikan). Temuan-temuan utama dari penelitian ini mencakup hal-hal berikut: (1) Program SCAMPER, ketika diintegrasikan dengan teknologi pendidikan, secara signifikan meningkatkan perolehan konsep-konsep pengajaran pendidikan jasmani oleh siswa, (2) Program ini juga berdampak positif terhadap retensi konsep-konsep ini dari waktu ke waktu, (3) Intervensi ini berkontribusi pada pengembangan komponen inti pemikiran kreatif di antara para peserta.

Kata Kunci: Program SCAMPER, Pendidikan Jasmani, Metode Pengajaran Konsep, Berpikir Kreatif.

INTRODUCTION

Allah Almighty has endowed human beings are inherently endowed with immense and diverse potential. Despite this, many individuals fail to recognize or cultivate their innate capabilities, often overlooking the profound gift they possess. This neglect leads to the underutilization and eventual stagnation of their talents—resources that, if properly harnessed, could yield significant benefits both personally and collectively. From a scientific and theological standpoint, every human is granted a remarkable cognitive capacity—the brain—an organ distinguished by its role in critical thinking, problem-solving, and continuous learning. Allah Almighty has made all human beings equal by providing them with the mind. The encouragement to utilize this intellectual faculty is emphasized in various religious texts. For instance, the Quran states, “Say: Are those who know equal to those who do not know?” (Surah Az-Zumar, 39:9), and also, “Of knowledge, you have been given only a little” (Surah Al-Isra, 17:85), highlighting the value and limitations of human understanding.

Creativity, in particular, has been a focal point of human inquiry across civilizations due to its essential role in advancement and innovation. A creative individual not only engages with present-day challenges through analytical and forward-thinking approaches but also draws insights from historical experiences to shape more effective solutions for the future. Creativity thus bridges past, present, and future, serving as a catalyst for societal progress and sustainable development (Al-Hussaini, 2017, p. 670).

Creative thinking is widely recognized as a vital cognitive skill and has been the focus of considerable scholarly attention, particularly within the disciplines of psychology and education. Researchers and educators have extensively explored its dimensions within pedagogical and psychological contexts, identifying key components such as fluency, flexibility, originality, and elaboration (Saada, 2011, p. 275). Despite a general consensus on the critical role of creative thinking in problem-solving, there remains substantial debate over the most effective methods for fostering these skills. A range of instructional strategies exists to promote higher-order thinking, each with distinct goals, applications, and relevance depending on the subject matter.

Global trends in education increasingly emphasize learner-centered approaches, with a strong focus on enhancing students' cognitive abilities across all academic stages

(Al-Hussaini, 2016, p. 272). Within this evolving educational landscape, Physical Education Teaching Methods stands out as a foundational course in the curriculum of colleges specializing in physical education and sports sciences. It plays a crucial role in preparing future educators who are capable of fostering intellectual and physical development in their students. University students, in particular, often possess a high capacity for innovative thinking, making this stage ideal for implementing strategies that encourage inquiry, problem-solving, critical questioning, and the practical application of theoretical knowledge.

The SCAMPER strategy—an acronym for Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, and Reverse—serves as a powerful tool for nurturing student creativity (Musa, 2012, p. 28). Originally conceptualized by Bob Eberle, SCAMPER is designed to facilitate the analysis, enhancement, and reconfiguration of problems or products. It has found applications across various domains, including economics, politics, industry, and education, due to its effectiveness in cultivating analytical, comparative, inferential, and creative skills. As such, SCAMPER is classified as a higher-order thinking strategy, aimed at advancing learners' cognitive development beyond foundational knowledge (Mizmar, 2016, p. 2).

Research Importance

The concepts of the third-year teaching methods course offered in the third year of the College of Physical Education and Sports Sciences represents a fundamental component of the academic curriculum at this stage. This course encompasses essential pedagogical elements, including instructional content, teaching materials, educational activities, and methods of assessment and evaluation. Given its comprehensive scope, it is imperative that instructors possess a clear understanding of the course objectives and curricular framework. Additionally, educators are expected to employ contemporary teaching strategies and integrate suitable educational programs tailored to the needs of the learners. By doing so, instructors can effectively facilitate knowledge acquisition, promote skill development, and ensure that students achieve the intended learning outcomes of the course. Accordingly, this study investigates the effect of the SCAMPER instructional strategy on students' understanding and retention of concepts related to physical education teaching methods, in addition to its role in enhancing creative thinking abilities among university students enrolled in physical education programs.

Research Problem

The advancement of education and the cultivation of diverse thinking patterns have emerged as central concerns among contemporary educators and scholars worldwide. Despite growing global interest in these areas, efforts within many Arab countries remain at a formative stage, particularly regarding the integration of thinking-based instructional methods into school and university curricula. Modern educational theorists argue that traditional forms of education are no longer sufficient to foster higher-order thinking skills or to meaningfully support students in understanding and internalizing key concepts. Consequently, there is a pressing need to adopt innovative teaching strategies, models, and programs that explicitly aim to nurture various cognitive and creative abilities within the educational process. This view is supported by numerous foundational studies, including those conducted by de Bono (1986) and John (1991), which emphasize the importance of deliberate thinking instruction as part of curricular reform.

Given the significance of the Teaching Methods course in the third year of the College of Physical Education and Sports Sciences—comprising a range of theoretical

and practical concepts—it is essential to move beyond conventional instructional practices centered on rote learning and passive knowledge transmission. Traditional methods, which often place the teacher at the center of the learning process, have shown limited effectiveness in fostering students' active engagement or in developing their creative capacities. In many cases, the goal of enhancing creative thinking is stated in course objectives but remains unimplemented in actual teaching practices. This disconnect may stem from educators' continued reliance on habitual, teacher-centered approaches that demand minimal planning or effort in designing learning experiences conducive to creativity.

Although the SCAMPER program offers considerable potential in promoting innovative thinking and concept mastery, its application within higher education—particularly in physical education contexts—remains underexplored. The limited number of empirical studies addressing SCAMPER's effectiveness in this domain reflects a broader neglect of creative teaching models in curricula that are, by their nature, rich with opportunities for active and experiential learning. In light of these considerations, the present study seeks to address the following research question:

What is the effect of the SCAMPER program on the acquisition and retention of physical education teaching method concepts, and on the development of creative thinking skills among university students?

METHOD

The researcher adopted the experimental approach, as it is the most appropriate method for examining the causal relationship between variables and assessing the effectiveness of the SCAMPER instructional strategy in the context of the study. The research population comprised all third-year students enrolled in the College of Physical Education and Sports Sciences at the University of Mosul during the 2022–2023 academic year. This population was distributed across six sections (A, B, C, D, E, and F), from which two sections—C and D—were purposefully selected to form the study sample. The final sample consisted of 46 students, after excluding 7 individuals due to absence or academic deferment. The selected participants were randomly assigned to two groups:

The experimental group (Section C), which included 23 students and received instruction using the SCAMPER strategy.

The control group (Section D), also included 23 students and was taught using conventional teaching methods. Distribution of the research sample before and after exclusion for experimental and control groups show in Table 1.

Table 1: Distribution of the research sample before and after exclusion for experimental and control groups.

Group	Number Before Exclusion	Number of Students Excluded	Number After Exclusion
Experimental	26	3	23
Control	27	4	23
Total	53	7	46

Experimental Design

The researcher employed two experimental designs to suit the objectives of the research. The first design involved equivalent groups subjected to both pre- and post-

testing to measure changes in creative thinking. The second design also utilized equivalent groups but relied on two post-tests to assess both the achievement and retention of selected concepts related to physical education teaching methods. Both designs required the formation of two groups: an experimental group exposed to the SCAMPER instructional strategy and a control group taught using traditional methods. The structure of these designs is illustrated in Figure 1.

Figure 1: Experimental design used in the research.

Groups	Equivalence Procedures	Pre-tests	Independent Variables	Post-tests	Retention Test
Experimental Group (Section C)	1. Prior knowledge test (initial) 2. Chronological age 3. Raven's Progressive Matrices (IQ test) 4. Academic achievement of parents and student 5. Student's birth order in the family 6. Place of residence	Creative Thinking Test	SCAMPER Program	1. Achievement Test 2. Creative Thinking Test	Achievement Test re-administered 15 days later
Control Group (Section D)	Same procedures as above	Creative Thinking Test	Traditional Method	1. Achievement Test 2. Creative Thinking Test	Achievement Test re-administered 15 days later

Equivalence and Homogeneity of the Research Groups

To ensure the validity of the experimental results, the researcher undertook several procedures to verify the equivalence and homogeneity of the two research groups across selected variables that could potentially influence the outcomes. These procedures were as follows:

Parental Educational Attainment

To assess whether differences in parental educational levels existed between the experimental and control groups, the frequencies of parental educational attainment were calculated. The Chi-square test (χ^2) was applied, revealing no statistically significant differences between the groups on this variable. This indicates that both groups were equivalent in terms of parental education, as illustrated in Tables 2 and 3.

Table 2: Shows academic achievement of the fathers of the individuals in the experimental and control groups, with the calculated and tabulated Chi-Square (χ^2) values.

Group	Illiterate	Reads & .	Primary	Intermediate	Subtotal	Secondary	Diploma	Bachelor's	Master's	Doctorate	Subtotal	Total	χ^2 (Calc.)	χ^2 (Tab.)
Experimental	3	2	3	5	13	5	3	1	1	0	10	23	1.87	3.84*
Control	2	4	2	6	14	4	2	2	1	0	9	23		
Total	5	6	5	11	27	9	5	3	2	0	19	46		

*Not statistically significant at the 0.05 significance level with 1 degree of freedom [(2-1) × (2-1)].

Table 3: Shows academic achievement of the mothers of the individuals in the experimental and control groups, with the calculated and tabulated Chi-Square (χ^2) values.

Group	Illiterate	Reads & .	Primary	Intermediate	Subtotal	Secondary	Diploma	Bachelor's	Master's	Doctorate	Subtotal	Total	χ^2 (Calc.)	χ^2 (Tab.)
Experimental	1	1	2	4	8	4	4	1	0	0	9	17	1.9	3.8*
Control	1	1	1	3	6	3	2	2	1	0	8	14		
Total	2	2	3	7	14	7	6	3	1	0	17	31		

*Not statistically significant at the 0.05 significance level with 1 degree of freedom [(2-1) × (2-1)].

1. Housing Environment

The researcher analyzed the distribution of the participants' residential locations—categorized as residing within or outside the city—across both the experimental and control groups. Using the Chi-square test (χ^2) to assess differences, the analysis revealed no statistically significant disparity between the two groups regarding this variable. Consequently, it can be concluded that the groups were equivalent in terms of their housing environment, as detailed in Table 4.

Table 4: Shows the place of residence of participants in the experimental and control groups, with the calculated and tabulated Chi-Square (χ^2) values.

Group	Inside the City	Outside the City	Total	χ^2 (Calc.)	χ^2 (Tab.)
Experimental	15	2	17	0.72	3.84*
Control	12	2	14		
Total	27	4	31		

*Not statistically significant at the 0.05 significance level with 1 degree of freedom [(2-1) × (2-1)].

2. Birth Order in the Family

The researcher examined the distribution of students' birth order within their families across the experimental and control groups. Frequencies were calculated, and the Chi-square test (χ^2) was employed to identify any significant differences. The results indicated no statistically significant variation between the two groups in terms of this variable. Therefore, the groups were considered equivalent regarding students' birth order, as presented in Table 5.

Table 5: Shows the birth order of students within their families in both the experimental and control groups, with the calculated and tabulated Chi-Square (χ^2) values.

Group	Student's Birth Order in the Family									Total	Chi-Square (χ^2) Values	
Order	1	2	3	4	5	6	7	8	9		χ^2 (Calc.)	χ^2 (Tab.)
Experimental	3	5	4	2	2	1	0	0	0	17	0.61	9.49*
Control	2	3	3	2	2	2	0	0	0	14		
Total	5	8	7	4	4	3	0	0	0	31		

*Not statistically significant at the 0.05 of significance with 4 degrees of freedom [(5–1) × (2–1)].

3. Student Academic Achievement

An analysis of student academic achievement frequencies for both the experimental and control groups was conducted using the Chi-square test (χ^2). The results indicated no statistically significant differences between the two groups. This finding confirms that the groups were equivalent in terms of academic achievement prior to the intervention, as illustrated in Table 6.

Table 6: Shows the student academic achievement in both the experimental and control groups, with the calculated and tabulated Chi-Square (χ^2) values.

Group	Student Academic Achievement			Total	Chi-Square (χ^2) Values	
Academic Streams	Science	Literature	Vocational		χ^2 (Calc.)	χ^2 (Tab.)
Experimental	5	9	3	17	0.82	5.99*
Control	3	8	3	14		
Total	8	17	6	31		

*Not statistically significant at the 0.05 level of significance with 2 degrees of freedom [(3–1) × (2–1)].

4. Chronological Age

The chronological age of students in both research groups was calculated in months, based on their birthdates up to October 1, 2022. A comparison between the two groups was conducted using the independent samples t-test. The analysis revealed no statistically significant difference in age between the groups, indicating that they were equivalent concerning the chronological age variable. These results are presented in Table 7, which demonstrates the equivalence of the two groups in terms of chronological age.

Table 7: Shows the equivalence of the research groups in the variable of chronological age.

Group	Equivalence Variable	Mean	Standard Deviation	t (Calculated)	t (Tabulated)
Experimental	Chronological Age (in months)	281.72	13.21	0.721	2.02*
Control	Chronological Age (in months)	286.28	14.72		

*Not statistically significant at a degree of freedom (44) and significance level (0.05).

5. Prior Knowledge Assessment

Establishing a uniform baseline for all participants is essential when evaluating the effectiveness and appropriateness of an instructional program. To determine the students' prior knowledge of second-stage teaching methods and to ensure equivalence between the experimental and control groups, the researcher designed a preliminary knowledge test consisting of 10 items. The test was reviewed by a panel of experts in the field of teaching methods, achieving a full consensus (100%) regarding its validity. The assessment was administered on October 6, 2022, and scored out of a total of 10 points. Statistical analysis using the independent samples t-test, based on the mean scores of both groups, revealed no statistically significant differences. This result confirms that the two groups were equivalent in their prior knowledge of the subject matter. The findings are detailed in Table 8.

Table 8: Shows equivalence of the research groups in the variable of prior knowledge.

Group	Equivalence Variable	Mean	Standard Deviation	t (Calculated)	t (Tabulated)
Experimental	Prior Knowledge (Total Score out of 10)	4.210	0.631	1.62	2.02*
Control	Prior Knowledge (Total Score out of 10)	4.710	0.713		

*Not statistically significant at a degree of freedom (44) and significance level (0.05).

6. Multiple Intelligences

To ensure equivalence between the experimental and control groups, the Multiple Intelligences Test developed by Nile Doklas was administered. This instrument was also used to determine the overall intelligence profiles of the participants. The test comprises 90 items, each with four response options: very rarely, rarely, sometimes, and often, assigned numerical values of 1, 2, 3, and 4, respectively. The test was reviewed by a panel of experts in teaching methods and educational assessment, who confirmed its content validity. Following data collection, the arithmetic mean scores for both groups were calculated. An independent samples t-test was conducted to compare the two groups, and the results indicated no statistically significant difference. This confirms the equivalence of the groups in terms of multiple intelligences, as presented in Table 9.

Table 9: Shows equivalence of the research groups in the variable of multiple intelligences.

Group	Equivalence Variable	Mean	Standard Deviation	t (Calculated)	t (Tabulated)
Experimental	Multiple Intelligences – Total Score (360)	319.20	29.12	0.91	2.02*
Control	Multiple Intelligences – Total Score (360)	314.51	13.16		

*Not statistically significant at a degree of freedom (44) and significance level (0.05).

7. Creative Thinking

The Al-Hilali (2009) Pre-Creative Thinking Test was administered to the research sample on October 14, 2022 to assess baseline equivalence between the groups. Following test administration, responses were scored and the arithmetic mean for each group was calculated. An independent samples t-test was conducted to compare the creative thinking scores of both groups, revealing no statistically significant difference. These results indicate that the experimental and control groups were equivalent concerning creative thinking, as detailed in Table 10.

Table 10: Shows equivalence of the research groups in the variable of creative thinking.

Group	Equivalence Variable	Mean	Standard Deviation	t (Calculated)	t (Tabulated)
Experimental	Creative Thinking	342.161	38.812	0.821	2.02*
Control	Creative Thinking	377.426	29.612		

*Not statistically significant at a degree of freedom (44) and significance level (0.05).

1.1 Procedural Steps for Implementing the SCAMPER Educational Program

A. Program Implementation Guidelines (10 minutes):

1. Allocate 90 minutes for the lesson delivery.
2. Review and remind students of the cooperative learning group instructions.
3. Begin by presenting each SCAMPER step, prompting questions, and facilitating discussion within the cooperative groups.
4. Each group shares their insights with the entire class to encourage collective reflection and feedback.
5. Utilize the program on computers as a reference during each SCAMPER step.

B. Introduction Phase (10 minutes):

1. The instructor introduces the concept and provides a concise overview.
2. Engage students by inviting questions related to the concept.
3. Provide relevant instructional materials and teaching aids such as images and models to support understanding.

C. Main Session (60 minutes): The session focuses on the ten stages of the SCAMPER model:

1. Substitute: For example, replacing a whiteboard with a blackboard and discussing the impact on both student and teacher experiences.
2. Combine: Merging elements, such as integrating an archery target with an air gun target.
3. Adapt: Applying an idea in a new context, e.g., converting a large car into a restaurant.

4. Magnify: Enlarging an object, such as increasing the size of a basketball hoop to encourage shooting practice.
5. Minify: Reducing size, for instance, making a soccer goal smaller to enhance precision skills.
6. Modify: Altering equipment, such as transforming gymnastics parallel bars into strength training apparatus.
7. Put to Other Uses: Repurposing items, e.g., installing solar panels on a car roof.
8. Eliminate: Removing elements, like replacing a car's reversing system with a 360-degree turn mechanism.
9. Reverse: Changing the order, such as giving the bill before dining.
10. Rearrange: Rearranging function, for example, using an umbrella to collect rainwater.

D. Conclusion Phase (10 minutes):
1. Summarize the key ideas discussed throughout the lesson.
2. Solicit student feedback regarding the program's steps and their academic benefits.

The lesson was conducted following the SCAMPER framework outlined by Al-Hussaini (2016, p. 278). The program was reviewed by a panel of teaching methodology experts who approved it following minor revisions.

1.2 Research Tools

1. Achievement Test

To assess students' mastery of physical education teaching method concepts, the researcher utilized the standardized achievement test developed by Wael Dathar Ali (2018) (Ali, 2018, p. 158). The test comprises 46 items, including 26 objective (multiple-choice) questions and 20 essay-type questions. It was specifically designed for third-year university students in the field of physical education. The test was administered on January 4, 2023, within the facilities of the College of Physical Education and Sports Sciences at the University of Mosul.

2. Creative Thinking Test

The creative thinking abilities of the participants were evaluated using the Al-Hilali Creative Thinking Scale (2009) (Al-Hilali, 2009, p. 269). This instrument measures core dimensions of creative thinking, namely fluency, flexibility, originality, elaboration, and problem-solving. The scale includes 99 items designed to assess both creative abilities and traits. It is a standardized tool suitable for university students and was administered on January 11, 2023, at the College of Physical Education and Sports Sciences, University of Mosul.

3. Retention Test

To evaluate the retention of learned material, a follow-up test—identical to the original achievement test—was administered on January 26, 2023, exactly 15 days after the initial test. This test was conducted with the same research sample and in the same academic setting, namely the College of Physical Education and Sports Sciences at the University of Mosul.

1.3 Specification of Academic Content:

The academic content targeted in the study consisted of four core chapters from the third-year curriculum on teaching methods in physical education. These chapters included:
1. Feedback
2. Planning the Physical Education Program
3. Methods of Teaching Physical Education
4. Evaluation

1.4 Statistical Procedures

To analyze the data and determine the results, the researcher employed the following statistical methods:

1. Arithmetic Mean
2. Standard Deviation
3. Independent Samples t-Test
4. Percentage
5. Chi-Square Test

All statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS). The adopted procedures align with standard statistical practices as outlined by Al-Talib and Al-Samarrai (1981, p. 266).

RESULTS AND DISCUSSION

Analysis and Discussion of Achievement Test Results

Achievement Test Results

To evaluate the validity of the first research hypothesis—which posits that there are no statistically significant differences in the mean scores between the experimental group, taught using the SCAMPER instructional strategy, and the control group, taught using conventional methods, in acquiring concepts related to teaching methods at the third-year level in the College of Physical Education and Sports Sciences—the researcher applied an independent samples t-test. This statistical test was used to determine whether significant differences existed between the two groups in their performance on the achievement test. The results of the statistical analysis, as detailed in Table 11, compare the performance of the experimental and control groups on the post-test measuring their acquisition of instructional method concepts.

As shown in Table 11, the computed t-value was 3.12, which exceeds the critical (tabulated) value of 2.02 at a significance level of 0.05 and 44 degrees of freedom. This result indicates a statistically significant difference between the mean scores of the experimental and control groups in their acquisition of physical education teaching method concepts. Consequently, the null hypothesis—which suggested no significant difference—is rejected, and the alternative hypothesis is accepted.

Table 11: Shows the t-value between the two research groups in the achievement test.

Group	Mean	Standard Deviation	t (Calculated)	t (Tabulated)
Experimental	43.38	10.23	3.12	2.02*
Control	29.16	9.72		

* Statistically significant at a degree of freedom (n−2 = 44) and a significance level of 0.05.

Discussion of Achievement Test Results

The results of the independent samples t-test revealed a statistically significant difference between the performance of the experimental group—who were taught using the SCAMPER instructional model—and the control group, which received instruction through traditional teaching methods, in acquiring the concepts related to third-year teaching methods. These findings are consistent with those reported in prior studies. For instance, Gladding and Henderson (2000) and Glenn (1977) found the SCAMPER strategy effective in enhancing the acquisition of scientific concepts. Similarly, Al-Husseini (2016) demonstrated the effectiveness of SCAMPER in fostering creative thinking among elementary students in science education.

Concerning the current research, the improved acquisition of teaching method concepts by third-year students in the College of Physical Education and Sports Sciences may be attributed to several key factors:

Enhanced Learning Environment

The SCAMPER strategy created a dynamic and engaging learning environment that encouraged active participation, critical thinking, and deeper understanding. By emphasizing inquiry and problem-solving through its structured steps, the program enabled students not only to learn concepts but also to develop cognitive pathways for independent knowledge construction. In support of this, Al-Ruwaithi (2012) asserts that the SCAMPER approach facilitates meaningful learning by promoting students' ability to think critically and construct knowledge autonomously (Al-Ruwaithi, 2012, p. 49).

Development of Generative Thinking Skills

The program fostered critical cognitive skills such as fluency, flexibility, hypothesis generation, and predictive reasoning. These skills likely contributed to students' improved conceptual understanding, thereby enhancing their performance on the achievement test. Hani (2013) emphasizes that SCAMPER's effectiveness lies in its ability to strengthen both student achievement and key components of generative thinking (Hani, 2013, p. 54).

Deeper Conceptual Understanding and Learner Confidence

Teaching through SCAMPER supported a more thorough grasp of the subject matter, while also increasing students' confidence in applying these concepts practically. This dual impact of conceptual clarity and self-efficacy contributed to improved academic outcomes. As Olivier (2009) notes, the SCAMPER program not only enhances learners' comprehension and awareness of concepts but also builds their confidence and equips them to apply these concepts in problem-solving contexts (Olivier, 2009, p. 86).

Discussion of Retention Test Results

The second hypothesis posits that there is no statistically significant difference between the mean scores of the experimental group—taught using the SCAMPER instructional model—and those of the control group—taught using conventional methods—in their retention of concepts from the third-year teaching methods curriculum at the College of Physical Education and Sports Sciences.

To evaluate this hypothesis, the researcher employed an independent samples t-test to compare the retention test scores of the two groups. The results of this analysis are presented in Table 12, illustrating the comparative performance of the experimental and control groups concerning content retention.

As shown in Table 12, the calculated t-value was 4.93, which exceeds the critical (tabular) value of 2.02 at a significance level of 0.05 and a degree of freedom of 44. This result indicates the presence of statistically significant differences between the mean scores of the experimental and control groups in the retention of physical education teaching method concepts. Accordingly, the null hypothesis is rejected, and the alternative hypothesis—suggesting a significant difference in favor of the experimental group—is accepted.

Table 12: Shows the t-value between the two research groups in the retention test.

Group	Mean	Standard Deviation	t (Calculated)	t (Tabulated)
Experimental	36.18	7.52	4.93	2.02*
Control	21.42	8.61		

* Statistically significant at a degree of freedom (n−2 = 44) and a significance level of 0.05.

Discussion of Retention Test Results

The t-test results revealed statistically significant differences between the experimental and control groups in their ability to retain concepts related to teaching methods for third-year students. The findings demonstrated that students in the experimental group, who were taught using the SCAMPER program, exhibited superior retention compared to those in the control group. Several factors may explain this outcome:

1. According to Touq et al. (2002), the process of concept acquisition is deliberate and conscious, and as such, information acquired through intentional learning tends to be better retained than that acquired incidentally (Touq et al., 2002, 347). In this context, the structured nature of the SCAMPER program, with its sequential and scientifically designed instructional steps, fostered an optimal learning environment. This environment supported the organization of classroom interactions and students' cognitive processes, enabling them to relate new concepts to prior knowledge and real-life applications. Consequently, the experimental group benefited from a more coherent and systematic understanding of the material, which facilitated long-term memory consolidation and retrieval.
2. Touq (1984) emphasized that the factors influencing retention are largely aligned with those impacting achievement. In essence, the same favorable conditions that enhance learning—such as a supportive environment, clarity of instruction, and engagement with educational technologies—also strengthen retention (Touq, 1984, 259). Through the SCAMPER program, the experimental group was exposed to these positive learning conditions, which contributed to improved concept acquisition and subsequently, greater retention compared to the traditional method experienced by the control group.
3. Khayoun (2002) noted that retention is fundamentally the ability to retrieve previously learned information and serves as a direct indicator of effective learning (Khayoun, 2002, 42). From the researcher’s perspective, the deliberate alignment of the SCAMPER program with factors known to enhance concept acquisition played a critical role in the learning process. The thoughtful implementation of this strategy helped students in the experimental group internalize teaching method concepts more effectively, store them efficiently in memory, and recall them successfully after a period without exposure.

Creative Thinking Test Results

The third research hypothesis posits that "there are no statistically significant differences between the mean scores of the experimental group, taught using the SCAMPER program, and those of the control group, taught using traditional methods, in developing the components of creative thinking among third-year students at the College of Physical Education and Sports Sciences." To examine this hypothesis, the researcher employed the t-test for independent samples to determine whether there were significant differences between the two groups in the creative thinking test scores. The results of this statistical analysis, as presented in Tables 13 and 14, provide a comparative view of the performance of the experimental and control groups in various dimensions of creative thinking.

An examination of Tables 13 and 14 reveals statistically significant differences between the experimental group, which was instructed using the SCAMPER program, and the control group, which received traditional instruction, in the development of creative thinking among third-year students in the College of Physical Education and Sports

Sciences. These differences favored the experimental group, as evidenced by the calculated t-value of 3.01, which exceeds the critical t-value of 2.02 at a significance level of 0.05 and 44 degrees of freedom. This indicates that the SCAMPER-based instructional approach had a notable impact on enhancing students' creative thinking skills compared to conventional teaching methods.

Table 13: Shows the means, standard deviations, and t-test values for the pre-and post-tests of the experimental and control groups in the creative thinking test.

Statistical Indicators / Group	Pre-Test Mean ± SD	Post-Test Mean ± SD	t (Calculated)	t (Tabulated)	Significance
Experimental	384.82 ± 39.72	412.15 ± 27.16	3.01	2.14*	* Significant
Control	372.15 ± 29.43	384.70 ± 24.19	1.07	2.20**	** Not significant

* Significant at degree of freedom (n−1 = 22) and significance level (0.05).
** Not significant at degree of freedom (n−1 = 22) and significance level (0.05).

Table 14: Shows the means, standard deviations, and t-test values distribution between the two research groups in the post-creative thinking test.

Statistical Indicators / Group	Post-Test Mean ± SD	t (Calculated)	t (Tabulated)	Significance
Experimental	412.15 ± 27.16	3.01	2.02*	* Significant
Control	384.70 ± 24.19			

* Significant at degree of freedom (n−2 = 44) and significance level (0.05).

Discussion of Creative Thinking Test Results

The findings indicate a positive impact of the instructional program designed based on the SCAMPER strategy on enhancing creative thinking among third-year students in the College of Physical Education and Sports Sciences. The researcher attributes the observed improvement in creative thinking—encompassing its core components such as fluency, flexibility, originality, and elaboration—to several key factors:

Enhanced Cognitive Engagement:

The implementation of the SCAMPER program significantly elevated students' cognitive engagement by prompting them to explore problem-solving through structured, inquiry-based educational questions. This method encouraged the identification of relationships and patterns, ultimately leading to well-structured solutions. According to Michalko (2011), the SCAMPER technique fosters higher-order thinking by engaging learners in logical reasoning and relationship analysis, thereby nurturing the development

of creative skills such as fluency, flexibility, originality, and elaboration (Michalko, 2011, p. 124).

Incremental Idea Development:

The SCAMPER model's segmented structure enabled learners to systematically dissect and reconstruct concepts. Each stage in the program supported the improvement of existing ideas and the generation of novel ones, thus fostering innovative thinking. Eragamreddy (2014) emphasizes that the creative process can be enhanced by deconstructing ideas into their components, refining each part individually, and subsequently synthesizing them into innovative outcomes (Eragamreddy, 2014, p. 143).

Stimulating Learning Environment:

The classroom environment created by integrating SCAMPER-based instruction with educational technology promoted active learning and engagement. This dynamic setting encouraged students to go beyond rote memorization and participate in activities designed to stimulate original thought. As noted by Ayesh (2008), instructional activities that encourage creativity are those that elicit original and nontraditional ideas, emphasizing cognitive engagement over passive recall (Ayesh, 2008, p. 88).

CONCLUSIONS

1. The integration of the SCAMPER instructional strategy with educational technology demonstrated a significant positive impact on third-year students' acquisition of teaching method concepts in the College of Physical Education and Sports Sciences.
2. The SCAMPER-based educational approach also proved effective in enhancing the retention of pedagogical concepts among third-year students, as evidenced by improved performance in the post-instructional retention assessment.
3. Furthermore, the use of the SCAMPER program, supported by technological tools, contributed to the development of key components of creative thinking—such as fluency, flexibility, and originality—among third-year students in the College of Physical Education and Sports Sciences.

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