The Effectiveness of Using the Visual Thinking Strategy in Blended Learning for Sensory-Style Learners on Cognitive Achievement and the Performance of Foil Thrusting Skills in Fencing among Female Students

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[1]*Received: 27/01/2026; Accepted: 26/02/2026; Published: 06/03/2026*

Abstract

The aim of the research was to develop visual thinking strategy exercises according to blended learning for sensory-style learners, and to identify the effect of visual thinking strategy exercises according to blended learning for sensory-style learners on cognitive achievement in fencing among third-year female students. It also aimed to identify the effect of visual thinking strategy exercises according to blended learning for sensory-style learners on learning the foil thrust skill in fencing among third-year female students.

The researcher used the experimental method with strict control using the equivalent groups design with pre- and post-tests due to its suitability to the nature of the problem. The research population was intentionally selected from third-year female students at the College of Physical Education and Sports Sciences / University of Kirkuk for the academic year 2025–2026, totaling (54) students. The research sample was selected randomly through a lottery method. The researcher considered the distribution of the sample, where the control group consisted of (20) students and the experimental group consisted of (20) students from Section (C). The researcher excluded (3) students who were members of the college fencing team and (6) absent students. A pilot study was conducted on (4) students.

The results indicated that the use of visual aids according to the visual thinking strategy played a role in improving and accelerating the understanding of concepts among third-year female students in learning the foil thrust skill in fencing. Furthermore, the method of presenting skill models significantly contributed to the learning of the experimental group, as observing the skill enabled learners to understand the movement pathway and develop a correct perception of the skill. The use of the visual thinking strategy according to blended learning for sensory-style learners increased students' motivation toward learning the foil thrust skill in fencing. Moreover, the method of employing and organizing the exercises had an impact on students' learning by exposing them to multiple stimuli while performing the foil thrust skill in fencing. The process of explaining, presenting, and performing the selected skills had a significant effect on learning and performance. In addition, the selection, sequencing, and repetition of exercises within educational units greatly contributed to organizing students' motor experiences according to the principles of exercise organization and attracting learners' attention, thereby facilitating the learning process.

[1] *How to cite the article:* Fadhil M.A.K.; (Mar 2026); The Effectiveness of Using the Visual Thinking Strategy in Blended Learning for Sensory-Style Learners on Cognitive Achievement and the Performance of Foil Thrusting Skills in Fencing among Female Students; *Multidisciplinary International Journal*,; Vol 12; 15-28

Keywords: *Visual Thinking Strategy; Blended Learning; Sensory-Style Learners; Foil Thrust Skill; Fencing.*

1. Introduction to the Research

1.1 Introduction and Significance of the Research

Achieving advanced levels in all sports can only be accomplished through the effective utilization of the capabilities of researchers and specialists in the field of sports. The development of these sports, including football, has emerged through the advancement of sports sciences, which have scientifically contributed to improving athletic performance. Numerous studies and research projects have been conducted, and these studies have played an essential role in enhancing athletes' performance levels. Countries have made considerable efforts and provided material and moral support to advance these sports across different age groups.

Fencing is considered one of the sports that has received increasing attention and development, leading to its widespread and rapid expansion worldwide. It is evident that visual thinking skills, despite their importance in the teaching and learning process, have not received sufficient attention from those responsible for planning and implementing educational curricula and teaching methods. Among the most important of these methods is the use of thinking maps, which many previous studies have confirmed as effective in developing visual thinking skills, particularly among students. Ameen stated that: *"The application of educational models requires that the learning environment be rich in stimuli and aligned with cognitive and technological developments, in addition to emphasizing the learner's active role"* (Ameen, 2023, p. 2).

Purposeful sports activities are achieved through proper planning and suitable methods that ensure the success of the educational process. Many developed countries in the field of sports have linked their achievements to the results attained by their athletes in championships and competitions held throughout the year worldwide. Competition among these countries has become increasingly intense in order to achieve the highest number of medals and championships, through which they gain recognition and prestigious international status.

The significance of the current research lies in the use of a visual thinking strategy within blended learning for sensory-style learners, aiming to improve and accelerate students' understanding of concepts, help them achieve better performance levels in fencing, and provide them with updated information that assists them in understanding movement pathways and developing a correct perception of the skill.

1.2 Research Problem

The foundation of effective planning in motor learning and teaching methods is the adoption of diverse educational approaches that enhance students' learning levels and help them achieve optimal performance. Achievement in the present era can only be attained through the systematic programming of learning and teaching according to scientific principles over many years in relation to motor, physical, skill-based, tactical, psychological, and educational aspects that every student and team should possess.

Through the researcher's observations, as a former national fencing team player and instructor of the same subject, fluctuations in the performance of the foil thrust skill were noticed, particularly among female students. This issue was represented by the limited use of diverse and modern educational and training methods and programs. Therefore, the researcher decided to investigate this problem by designing visual thinking strategy exercises according to blended learning for sensory-style learners and examining their effect on cognitive achievement and the performance of the

foil thrust skill among third-year female students at the College of Physical Education and Sports Sciences, University of Kirkuk.

1.3 Research Objectives

1. To develop visual thinking strategy exercises according to blended learning for sensory-style learners.
2. To identify the effect of visual thinking strategy exercises according to blended learning for sensory-style learners on cognitive achievement and learning the foil thrust skill in fencing among third-year female students.

1.4 Research Hypothesis

- There are statistically significant differences in the post-tests between the control and experimental groups in the fencing thrust skill in favor of the experimental group.

1.5 Research Scope

1.5.1 Human Scope: Third-year female students at the College of Physical Education and Sports Sciences, University of Kirkuk, for the academic year 2025–2026.

1.5.2 Time Scope: From 16/2/2025 to 10/4/2025.

1.5.3 Spatial Scope: Fencing Hall at the College of Physical Education and Sports Sciences, University of Kirkuk.

2. Research Methodology and Field Procedures

2.1 Research Methodology

The researcher used the experimental method with strict control using the equivalent groups design with pre- and post-tests due to its suitability to the nature of the research problem.

2.2 Research Population and Sample

The research population was intentionally selected from third-year female students at the College of Physical Education and Sports Sciences, University of Kirkuk, for the academic year 2025–2026, totaling (54) students. The researcher selected the research sample randomly through a lottery method and considered the distribution of the sample. The control group consisted of (20) female students, while the experimental group consisted of (20) female students from Section (C), representing (74.07%) of the research population.

The researcher excluded (3) students who were members of the college fencing team and (6) absent students. A pilot study was conducted on (4) female students from Section (C).

2.3 Means of Data Collection, Equipment, and Research Tools Used

2.3.1 Means of Data Collection Used in the Research

- Arabic and foreign sources and references

- Personal interviews
- Tests and measurements
- Internet resources

2.3.2 Equipment Used in the Research

- DELL electronic computer
- Device for measuring height and body mass
- Casio stopwatch
- Digital video camera (Sony 8M)

2.3.3 Tools Used in the Research

- Fencing field
- (20) legal foil weapons
- Adhesive tape (metallic type, 3 m length)
- (2) video films (Sony Album type)
- (10) CD discs
- (20) markers
- Whistle
- Stopwatch
- (40) cones
- (20) training bibs
- (12) sticks
- Marker pens
- (20) ballpoint pens

2.4 Field Research Procedures

2.4.1 Sensory Learning Style Scale

The researcher adopted the scale developed by Ibrahim (2011: 141) to identify sensory-style learners within the research sample. The scale was then presented to experts and specialists to determine its suitability for the research sample after modifying certain items to fit football-related contexts. All experts confirmed the validity of the scale with an agreement rate of (100%).

The scale is a paper-and-pencil test designed to identify the students' preferred learning system and assist instructors in selecting appropriate activities according to the test results. The test consists of (20) items, each containing three possible responses. The participant selects only one response from the three alternatives, and each item is assigned one point.

2.4.2 Cognitive Test

To measure the level of students' cognitive achievement regarding the researched skills according to the three levels (knowledge, comprehension, and application), the researcher relied on the items of the cognitive achievement scale

developed by Nouri (2019: 135), which was applied within the Iraqi context after its items had been prepared and formulated by experts and specialists in the fields of motor learning and fencing.

2.4.3 Tests Used in the Research

Foil Thrust Skill Test (Abdulkarim, 2021: 235)

Test Name: Accuracy of Targeting Using the Thrust Movement

Purpose of the Test: To determine the accuracy of targeting using the thrust movement in fencing.

Required Equipment:

- A target representing the legal target area of the foil weapon
- An electric fencing device
- An electric foil weapon
- Connection wire
- Two foil weapons

Performance Specifications:

The participant stands in the ready position in front of the target after all equipment has been properly connected. Markings are placed on the floor to determine the position of the feet in the ready stance, allowing the participant to reach the target with the tip of the weapon while performing the thrust movement. The participant is then given a signal to thrust toward a specified location and is required to respond immediately without delay. Each participant is given (10) attempts.

Scoring Method:

Only successful attempts are recorded. Success is determined by the correspondence between the given signal and the target area touched, in addition to the illumination of the indicator light on the electric fencing device.

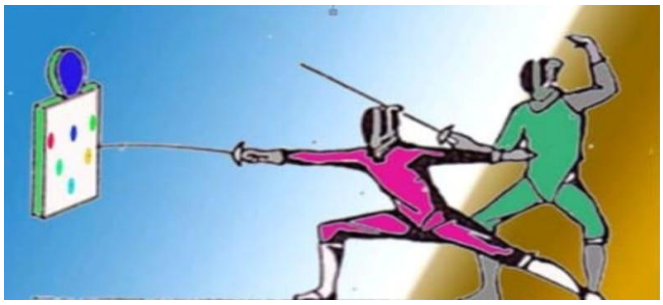

Figure (1) illustrates the Foil Thrust Skill Test.

2.5 Pilot Studies

2.5.1 First Pilot Study

A pilot study is defined as *"a preliminary experimental study conducted by the researcher on a small sample prior to the main experiment, with the aim of testing research methods and instruments"* (Hatab, 1984: 34).

For the purpose of obtaining the necessary results and following the scientific procedures of the research, the researcher conducted the first pilot study for the sensory learning style test, cognitive achievement test, and fencing thrust skill tests on a sample consisting of (4) third-year female students from the College of Physical Education and Sports Sciences / University of Kirkuk, who were outside the main research sample, with the assistance of the research team on 15/2/2026. The objectives of the pilot study were as follows:

- To verify the suitability of the cognitive test for the research sample.
- To verify the suitability of the testing location and its appropriateness for implementation.
- To determine the readiness of the research sample to perform the test.
- To determine the time required for conducting and implementing the tests.
- To verify the suitability of the tests for the research sample.
- To identify possible difficulties that may arise during the research procedures.

2.5.2 Second Pilot Study

The researcher conducted this pilot study for the visual thinking strategy exercises according to blended learning on the same sample used in the first pilot study, which consisted of (4) female students, on 16/2/2026. Through this pilot study, the following aspects were identified:

- Determining the suitability of the exercises to the sample's level.
- Identifying difficulties and problems that might arise during the implementation of the exercises.
- Determining the appropriateness of the selected sample and the extent of its responsiveness to these exercises.
- Determining the suitability of the exercises within the allocated time of the educational units.

2.6 Pre-tests

The pre-tests were conducted on both the experimental and control groups before implementing the visual thinking strategy in order to determine the level of fencing offensive skills among the research sample. The tests were administered on 19/2/2026 in the fencing hall at the College of Physical Education and Sports Sciences, University of Kirkuk.

2.7 Visual Thinking Strategy

The researcher prepared the instructional program according to the visual thinking strategy for learning offensive skills in fencing after reviewing and benefiting from a number of scientific sources, in addition to his experience as a former national team player and instructor of the subject.

The instructional program consisted of (6) weeks, with (2) educational units per week, and each educational unit lasted (90) minutes according to the college's weekly schedule. Therefore, the total duration of the two weekly educational units was (180) minutes.

The following presents the time distribution of the instructional program and the exercises used within the visual thinking strategy according to blended learning for sensory-style learners in fencing among female students:

- Number of weeks: (12)
- Number of educational units per week: (2) educational units
- Total number of educational units: (6 × 2) = (12) educational units
- Exercise duration ranged from (3–5 minutes) depending on the level of difficulty from simple to complex
- Number of exercises: (25) exercises
- Duration of one educational unit: (90) minutes
- Total duration of educational units: (90 × 12 = 1,080) minutes
- Number of exercises in each educational unit ranged from (3–5) exercises
- The experimental group worked according to the visual thinking strategy
- The control group followed the regular curriculum adopted by the college

Accordingly, each educational unit consisted of the following:

Preparatory Section:

Included (15 minutes), consisting of:

- (3 minutes) for organizational procedures
- (8 minutes) for general warm-up
- (4 minutes) for physical exercises

Main Section:

Included (60 minutes), consisting of:

- (20 minutes) for educational activities, including explanation, skill presentation, and model demonstration
- (40 minutes) for the practical section using exercises according to the visual thinking strategy

Concluding Section:

Included (15 minutes), consisting of:

- (7 minutes) for a small motivational game
- (8 minutes) for cool-down exercises and concluding greetings

Note: There appears to be a numerical inconsistency in the original text regarding the number of weeks and total educational units (6 weeks vs. 12 weeks, and 12 units vs. "twenty units"). The translation preserves the content while reflecting the stated calculations.

In designing the main experiment, the researcher took the following considerations into account:

- Determining specific objectives for each educational unit.

- Ensuring that each educational unit achieves one educational and behavioral objective, or at most two objectives.
- Ensuring that each exercise used contributes to achieving the objectives of the educational unit.
- Taking into consideration the necessity of applying the offensive skills under study that had been learned in previous educational units within subsequent units in order to reinforce and consolidate learning, as well as to establish connections between previously learned skills and subsequent skills.

Table (1): Distribution of the Sections of a Single Educational Unit, Their Duration, and Percentage Ratios within the Proposed Program for the Experimental Group

S	Educational Unit Sections	Time During the Educational Unit (min)	Time Throughout the Program (min)	Percentage (%)
1	**Preparatory Section**	**15 min**	360 min	**% 33.33**
2	**Main Section**	60 min	1440 min	**% 133.33**
	Educational Part	20 min	480 min	**% 44.44**
	Practical Part	40 min	960 min	**% 88.88**
3	**Concluding Section**	15 min	360 min	**%33.33**
Total		**90 min**	**1080 min**	**% 100**

2.7.1 Introductory Unit of the Proposed Skill Program

Before commencing the implementation of the instructional units for the offensive fencing skills under study, the researcher conducted an introductory educational unit for the main research sample in order to familiarize the students with the method of performing the fencing offensive skill exercises. This unit is considered one of the educational units designed by the researcher and represents a necessary foundation at the beginning of the learning process.

The introductory unit was implemented on 22/2/2026, during which the fencing thrust skill was explained and practiced in a simplified manner.

2.7.2 Implementation of the Main Experiment

After conducting the introductory unit and preparing the technical requirements of the educational units, the subject instructor, under the direct supervision of the researcher, began implementing the main experiment from 24/2/2026 to 8/4/2026.

The visual thinking strategy was applied through the following steps designed by the researcher to ensure proper integration of the fencing offensive skills under study:

First: Division of the sample according to sensory learning style

The students of the experimental group were divided according to the previously identified levels. A leader was assigned for each group, whose role was to consult with group members when presenting a problem in order to select the most appropriate performance solution among the proposed alternatives for the given skill situation, and then provide the answer.

Second: Defining and understanding the situation

At this stage, the instructor must ensure that the situation is clearly understood by the student in relation to learning the presented skill. This stage contributes to clarifying the situation and identifying its main elements through several guiding questions directed to the students, such as:

- What is required to achieve proper acquisition of the skill?
- What are the conditions and components of the situation required for learning the skill?

Third: Generating solutions

This stage is related to selecting the appropriate solution. The instructor supports the students by presenting guiding questions that lead them toward reaching the idea of the solution in learning the skill, such as:

- Do you have an idea about the skill?
- Have you encountered this situation while practicing with your teammates or seen it in local or international matches?
- Have you experienced a similar situation while performing the skill in a familiar context that you previously solved?

Fourth: Implementation

To assist the students in performing the learned skill, the instructor, under the supervision of the researcher, guided the students to review each step of the offensive skill learning process. This was done through instructional guidance using several questions directed to the students, as follows:

- Can you clearly see that each step of learning the skill is understood and performed correctly?
- Can you demonstrate that the performance you selected is correct through its practical application?

Fifth: Reviewing the Solution and Verifying Its Validity

This stage is conducted by asking the following question:

- Can you apply the performance you have reached in other situations that may occur during practice, such as playing with your colleagues or in other environments (e.g., outdoor courts or grass fields)?

2.8 Post-tests

After completing the implementation of the experimental training exercises, the post-tests were conducted on the experimental group on 13/4/2026. The researcher ensured that the same conditions were maintained in terms of time, place, equipment, tools, implementation method, and work team in order to replicate the conditions under which the pre-tests were conducted.

2.9 Statistical Methods

The researcher used the Statistical Package for the Social Sciences (SPSS) to process and analyze the data and extract the results.

3. Presentation and Discussion of Results

3.1 Presentation of Post-test Results for the Experimental and Control Groups

First: Presentation of the results of the arithmetic mean, standard deviation, calculated (T) value, and the type of difference between the post-tests of the experimental and control groups in the foil thrust skill in fencing.

Table (2) shows the arithmetic mean, standard deviation, calculated (T) value, and the type of difference between the post-tests of the experimental and control groups in the foil thrust skill in fencing.

Variables	Experimental Group		Control Group		Calculated (T) Value	Significance Level	Significance of Differences
	M	SD	M	SD			
Auditory	35.632	0.981	37.473	1.078	-2.935	.017	Significant
Visual	35.685	0.524	38.540	2.249	-3.529	.005	Significant
Kinesthetic	35.940	0.884	37.677	2.461	-1.768	.099	Not Significant

3.2 Presentation of the Results of Analysis of Variance for the Research Tests Used

First: Presentation of the results of one-way analysis of variance (ANOVA), the calculated (F) value, and the significance of differences among the three preference styles in the results of the foil thrust skill test in fencing.

Table (3) shows the one-way analysis of variance (ANOVA), the calculated (F) value, and the significance of differences among the three preference styles in the results of the foil thrust skill test in fencing.

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	Calculated F Value	Significance Level	*Significance of Differences*
Between Groups	46.719	5	9.344	3.739	.008	*Significant*
Within Groups	84.973	34	2.499			
Total	131.692	39				

3.3 Discussion of the Results of Offensive Fencing Skills

It is evident from the previous tables, after processing the values of arithmetic means and standard deviations between the pre- and post-tests in the results of the basic fencing skill tests, which were exposed to a new variable represented by the visual thinking strategy according to blended learning and pictorial modeling preference, that the differences in the statistical values of the (T) test were in favor of the post-test, as well as in the results of the analysis of variance.

The researcher agrees with (Abdulrahman Nabhan Ismail) that the reason for the significant results of the research sample is that the exercises used in the instructional units were implemented using the observation method (demonstration and modeling). Since the learners in this group are visual-type learners, their reception of information according to their preferred learning system in general means that "seeing different movements performed as a model in front of the learner through films or pictures, and the learner's observation of the movement to be learned are among

the factors through which the learner can form an initial perception of the general shape of the new movement, as well as recognize the important parts of the new movement. The learner is also able to retain an impression of that movement or skill. If the model is repeated again in a slow manner, the learner can form a clearer image of the movement" (Khion, 2010: 184).

This is supported by Khion (2010: 92), who stated that "when there is a clear image in the learner's mind, correct performance is expected." These results are consistent with the study of (Abdulhussein, 2009: 70), which indicated that "the learner's observation of the skill helps him understand the movement path and develop correct bodily perception of it, i.e., controlling its technical performance." Ibrahim also adds that "one of the most important factors for the success of an attack is the correct selection of timing and appropriate distance while maintaining accuracy in performance" (Abdulaziz, 1999: 23).

The researcher attributes these results to several factors, most importantly the use of this strategy and how it was applied. Through this method, students acquire a set of theoretical knowledge, practical skills, and desired attitudes. Dealing with skills and multiple situations requires not only knowledge and practical skills to face the changing and fast-paced nature of the game, but also the acquisition of skills necessary to successfully deal with new and unfamiliar situations that they have not previously encountered. It is also important to note other factors such as variation in exercises, repetitions, feedback, and efficient use of time and effort in organizing and distributing repetitions. Muska (1994: 91) confirmed that "the basic and necessary principle in learning skills that show clear progress is attention to practice attempts and their variation."

Furthermore, the students' motivation to learn basic fencing skills increased their learning drive and helped achieve the main objective of transferring information from teacher to learner in various ways and embedding it in motor memory. Bloom indicated that there is a closed cycle of motivation within the student, as the learner searches for errors as achievement progresses, and gains experience and a sense of responsibility and competence with full control over the educational units after they were initially difficult.

The researcher also attributes the improvement in the thrust skill to good performance and enthusiasm resulting from the motivational and engaging exercises used in the study. This finding is consistent with what Hilmi (2000: 125) stated: "The use of exercises in physical education lessons activates the nervous and physical systems, and also plays an influential role in developing psychological aspects by making students accept the lesson with happiness and enjoyment, which generates motivation and inclination toward practicing sports."

3.4 Cognitive Achievement Results

First: Presentation of the results of the arithmetic mean, standard deviation, calculated (T) value, and the type of difference between the post-tests of the experimental and control groups in cognitive achievement.

Table (4) shows the arithmetic mean, standard deviation, calculated (T) value, and the type of difference between the post-tests of the experimental and control groups in cognitive achievement.

Variables	Experimental Group		Control Group		Calculated (T) Value	Significance Level (Sig.)	Significance of Differences
	M	SD	M	SD			
Cognitive Achievement	25.850	1.424	24.250	1.372	3.618	.001	Significant

3.5 Discussion of Cognitive Achievement Results

The researcher believes that success and the acquisition of knowledge and information are achieved through the integration of practical sports practice and the scientific knowledge related to that activity. It is essential for every student to be well-informed with the sports knowledge related to the game she practices. Al-Khouli (2001: 16) states that "it is not reasonable for an individual to practice an activity with confidence without a stock of knowledge that supports it, and the cognitive aspect may be the decisive factor between one individual and another." Thus, sports knowledge is no longer a secondary or supplementary outcome in physical education curricula but has become a fundamental component; therefore, the learner must know first and then practice.

The researcher also adds that the students' interest, follow-up of lessons, understanding, and enthusiasm for the game have contributed to increasing and acquiring information in both skill-related aspects and the rules of the game throughout the lessons. This is attributed to the information provided to the experimental group, which indicates their understanding and acceptance of it. This is confirmed by Qatami (2000: 129), who stated that "when an individual's knowledge base increases, his ability to solve problems increases, whether in theoretical aspects or performance."

The improvement in the experimental group is also attributed to the effectiveness of the strategy in enhancing the cognitive ability of the students, as their intellectual and mental development contributes to faster learning, skill mastery, and reaching proficient performance. This aligns with Farhat (2001: 88), who stated that "understanding and applying performance and tactics play a major role in knowledge and have a significant effect on developing skill performance." Similarly, Al-Khouli (2000: 88) noted that "knowledge is the true measure for benefiting from motor skills in performance, which mainly depends on selecting the appropriate position, choosing a correct movement start, and selecting an appropriate performance strategy, all of which are mental factors based on correct knowledge of types and methods of motor skill performance."

The researcher attributes the differences in favor of the experimental group not only to learning but also to the learning style, which plays an important role in the learning process. The learning style helped highlight fine details of skills, increasing the student's ability to understand movement requirements, providing a clear image of the skill, identifying strengths and weaknesses, eliminating incorrect movements, and reinforcing correct ones. Feedback is considered one of the most important requirements in the learning process, as it helps improve the performance of high-achieving students and raise the level of weaker students.

In this regard, Mahjoub (2001: 130) indicated that the collection of information obtained by the learner from various internal and external sources before, during, or after motor performance aims to modify motor responses to reach optimal performance, and it is one of the essential conditions of the learning process. Osama Abdulrahman also emphasized that "there is no attack more successful than another; rather, success depends on the opponent's performance, and each attack must be linked to the opponent's strategies, abilities, and skills" (Osama, 2002: 52).

From the above, the researcher concludes that each student's motivation and determination to learn are important and influential factors in the learning process. The greater the motivation, the better the level of learning. Moreover, diversity in instructional strategies and learning environments contributes to increasing student independence as a leader or explorer within their group, relying on self-learning and freedom in discovering solutions. In this regard, Qalada (1998: 22) confirmed that teaching methods must be diverse, as using a single strategy for all educational situations was long believed to be effective; however, diversity increases learners' motivation and positively affects their attention and engagement, making students more receptive to learning. Teachers who use variety keep learners engaged and interested in the lesson, and thus diversity in strategies is the key to enhancing learning (Al-Hamid, 2000: 53).

4. Conclusion

Based on the results, the researcher concluded that the use of visual aids according to the visual thinking strategy played an important role in enabling third-year female students to understand concepts more clearly and more quickly in learning the foil thrust skill in fencing. The method of presenting skill models significantly contributed to the learning of the experimental group, as the learner's observation of the skill helped her understand the movement pathway and develop a correct perception of the skill.

The use of the visual thinking strategy within blended learning for sensory-style learners also increased students' motivation toward learning the foil thrust skill in fencing. Furthermore, the way exercises were employed and organized had a clear impact on students' learning, as it exposed them to multiple stimuli during the performance of the foil thrust skill.

In addition, the processes of explanation, demonstration, and performance of the selected skills within the educational activity had a significant effect on learning and performance. The selection, sequencing, and repetition of exercises within the educational units contributed greatly to organizing the students' skill experiences according to the principles of exercise organization. This also helped attract learners' attention and facilitated the learning process.

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