The Effect of Using Mind Maps on the Level of Cognitive Achievement and Skill Performance according to Learning Styles in Fencing

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Introduction

Education is the most important means by which countries rely on them to catch up with the progress, and education is the set of strategies and methods by which develop information, skills and trends of the individual or the group (14).

Modern education aimed to bring out the traditional form of education to a more positive and effective formula at developing the capacity of the learner to the better of what qualifies his potentials and capabilities (2).

"**Al Hamahmi and El Kholi**" (**1990**) refers to the Physical Education as a pedagogical must be organized structure of knowledge in it about a distinct structure of concepts where available for the students to learn selected concepts hierarchically, which positively affects in the central nervous system of humans in terms of reception, storage and recall (5).

Visual learning is a proven teaching method in which diagrams such as concept maps, mind maps, tree diagrams, organization charts and spider diagrams are used to help students of all ages think and learn more effectively.

"**Zayton**" (**2005**) considers mental maps as intermediates between verbal and non-verbal methods in the teaching process and is helping to coordinate any system or set of interrelated knowledge (25).

Mind maps are a diagrammatic way of recording information that is easy touse, adapt and recall, use visual stimulation to structure and memorize knowledgeeffectively.

Mind maps (or similar concepts) have been used for centuries for learning, brainstorming, memory, visual thinking, and problem solving by educators, engineers,

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psychologists, and people in general (7).

Individual differences preoccupied psychological studies specialists through the ages, where a large number of studies have shown the existence of individual differences among individuals in learning styles and thinking, where differ among themselves in terms of their preferences for methods of thinking and learning styles of their own distinguish them from others.

The ways in which an individual characteristically acquires, retains, and retrieves information are collectively termed the individual's learning style (19).

Numerous studies confirmed that there is a special style of learning for each learner and which is different from the others in reception, processing and retention information. And its show that matching teaching styles to learning styles can significantly enhance academic achievement, student attitudes, and student behavior at the primary and secondary school level As in study of "**Griggs & Dunn**" (**1984**); "**Smith & Renzulli**" (**1984**), at the college level "**Brown**" (**1978**);

"**Charkins et al**." (**1985**), and specifically in foreign language instruction "**Oxford et al**." (**1991**); "**Wallace & Oxford**" (**1992**).

There are several known models of learning styles such as: **Dunn and Dunn**, **McCarthy** format model, **Kolb**, **Hill**, and **Fleming Vark** model, and the researcher have adopted **Vark** model of learning styles which includes (visual, auditory, reading / written, kinetic) styles.

Visual learners prefer that information be presented visually in pictures, diagrams, flow charts, time lines, films, and demonstrations rather than in spoken or written words. (19). Auditory learning is a learning style in which a person learns through listening. An auditory learner depends on hearing and speaking as a main way of learning (15).

Kinesthetic Learning or Tactiles Learning is a learning style in which learning takes place by the students carrying out physical activities, rather than listening to a lecture or watching demonstrations (16). Read/Write Learner Prefer that information be displayed as words, this preference emphasizes text-based input

and output - reading and writing in all its forms.

Success in the selection of teaching methods that can be used in the field of Physical Education depends on how the teacher realize the experiences of learners, their levels, and the individual differences between them, as well as their orientation and their preferences (14) (2). So the learning style as a means of information processing, may facilitates or hamper achievement of performance (9).

Fencing characterized by a high degree of difficulty as well as it requires an accurate and distinct technical performing, it needs a distinct kinetic capabilities, as it is not widespread, the researcher noticed the lack of information among female students about fencing, and Due to variation of learning styles among female students, so it was necessary to search for a suitable educational methods based on scientific and practical principles to cope with multi difficulties facing the female students which may restrict learning, and that through the study of the effect of using mind maps on cognitive achievement and skill performance in Fencing according to learning styles.

Aims of the study

This study aimed to identify the effect of using mind maps on the Cognitive achievement and skill performance in fencing among female students through:

- Identify learning styles prevalent among to Second Grade female students.

- Design mind maps of fencing curriculum scheduled to Second Grade Students in the Faculty of Physical Education, Sadat City University.

- Building cognitive achievement test for second grade students to measure cognitive achievement level in fencing.

Hypotheses of the study:

- There are significant differences between the averages of pre and post measurements for experimental and control groups in both cognitive achievement and skill performance In favor of post measurements.

- There are significant differences between the experimental and control groups in the post measurements in both

cognitive achievement and skill performance In favor of experimental group.

Material and Methods Data collection

- Verbal intelligence test, which was prepared by "Gaber Abdel-Hamid, Mahmoud Ahmed Omar" (2007). Attachment (1)
- Mind maps of fencing curriculum (prepared by the researcher). Attachment (2)
- Cognitive achievement test in fencing (prepared by the researcher). Attachment (3)
- VARK test to measure learning styles. Attachment (4)

Study method

The researcher used the experimental method by using pre and post measurements for two groups, experimental and control.

Participants

Participants were 46 second year female students on the Faculty of Physical Education, Sadat City University for the academic year 2013/2014, were divided into two groups, one experimental and the other is control, the strength of each group 23 female students, Mind maps of fencing curriculum has been applied to the experimental group, the conventional method has been applied to the control group.

The skewness coefficient of the research variables confined between ±3 which indicates moderating of distribution, and there are no significant differences between experimental and control groups in the pre measurements which indicates equality of the two groups in the research variables.

Research procedures:

1. Preparation of mind maps:

To prepare mind maps used in teaching the theoretical and practical parts of fencing, the researcher had the following:

- Analysis content of theoretical and practical parts to identify the main and sub concepts in each part, and identify the existing relations between them.
- Building mental maps of each lecture, in accordance with the foundations followed when building these maps so, write the title of the subject in the center of the page, draw lines out and Label these lines with subdivisions or subheadings, uncover another level of information belonging to the subheadings and draw these as lines linked to the subheading lines.

- Maps offered on a group of professors specialists in each of fencing and Curriculum and Instruction, these maps have been modified and rebuilt based on their views and suggestions, so these maps become finalized usable, (5).
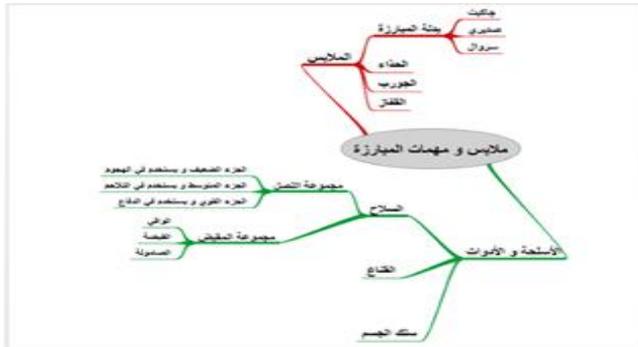
2. Preparation of cognitive achievement test:

Test designed by the researcher and was done in preparation the following steps:

• Defining the goal of the test:

Test aimed to identify the cognitive achievement level of the contents of fencing curriculum, scheduled to second grade students, according to the college regulation with regard to academic plan.

• Preparing the outline of the test:

According to the objective of the test, it has been prepared through the utilization of some studies that contained the cognitive tests in fencing, The researcher Concluded to identify the scientific article which included (4) main axes, It was displayed on a number of experts to express an opinion regarding the extent they relate to the fencing curriculum scheduled to the female students, To propose what is add or delete from, and have been determine the relative significance of all the axis and the number of phrases for each axis according to its relative significance, table (1).

Table (1)
Cognitive test axes and the relative significance of each axis

	Cognitive testing axes	relative significance	Number of phrases
1	History	%١٠	٣
2	Law	%٢٠	٦
3	basic skills	%٣٠	٩
4	Offensive and defensive skills	%٤٠	١٢
	Total	٪١٠٠	٣٠

• Determine the type of questions:

Were selected two types of questions, multiple choice questions & true or false questions, where they are useful for measurement the understanding, answered in a short time, and also easy to patch.

• Identify and formulate the phrases:

The researcher formulated the test questions and put it in the form included a set of 35 items (initial formula) In order to identify which valid items of the test, and have been presented to the experts in fencing, Some items have been deleted, according to the opinions of experts due to the recurrence of the content or the lack of distinctness, the test has been reached to 30 items agreed on them, with formulation amended some items to become finalized ready for applying.

• Test Instructions:

Taking into account that test instructions be written in an intact and correct language so away from the prolongation, with determine the method of and where recording the answers.

• Patch test:

The researcher identified one point for each question.

• Analysis of test phrases:

The researcher had applying the test on a rationing sample of 21 student in order to calculate the ease, difficulty and discrimination coefficient. And turned out that all the items has achieved conditions for its acceptance, so the cognitive achievement test become finalized ready for applying with (30)

• Determine the test time:

The researcher used the following mathematical equation to determine the test time:

The time required to test = (time it took the first student + time it took the last student)/2, and thereby could determine the test time, and it was 15 minutes.

3. Survey study

Preliminary Survey study:

The researcher had applying cognitive achievement test on a rationing sample of 21 student who already study their fencing curriculum for the second year in 15/2/2014 and in order to calculate ease, difficulty and discrimination coefficients, as well determine time required for testing.

The second Survey study:

The researcher conducted the second survey study on a sample of 15 female students from the same research community and outside the research participants in the period from February 19, to February 26, 2014, and for the purpose of rationing scientific coefficients for research tools, and make sure that the place appropriate, and the measurement tools are valid.

Scientific coefficients for tests:

First: validity

For cognitive achievement test The researcher calculated the validity of internal consistency of the cognitive achievement test, which included (30) phrase where she applied cognitive achievement test on a rationing sample of 21 student, and was reached: -

- There is a statistically significant correlation between each phrase and the total of the axis which it belongs.

- There is a statistically significant correlation between each phrase and the total score of the test.

- There is a statistically significant correlation between the score of each axis and the total score of the test.

For the IQ test and learning styles scale (VARK), we found validity coefficient for the test through self- validity by finding the square root of stability, with a coefficient 0.921 for IQ test, and ranged from 0.778 to 0.907 for learning styles scale.

Second: reliability

For cognitive achievement test, the researcher calculates the test stability by Cronbach's alpha coefficient of the responses of rationing sample of 21 student, and the stability of the value of alpha

coefficient ranged from 0.538 to 0.732 for the test axes.

For the IQ test and learning styles scale (VARK), reliability coefficient was tested by test re-test to a sample of 15 female students from the Second grade, It was a week between the two applications, and has reached the reliability coefficient 0.848 for IQ test and ranged from 0.606 to 0.823 for learning styles scale.

4. Pre- measurements:

Pre- measurements were conducted for a sample in basic research March 2, to March 3, 2014, they included:

- Measuring the learning styles of students.

RESULTS

- Measuring the Cognitive achievement level in fencing to students.
- Measuring the skill performance in fencing for the students.

5. Implementation of the program:

The program was implemented in the period from March 5, to April 23, 2014, at a rate of two hours per week. And the program has continued (8) weeks.

6. Post measurements:

Post measurements were conducted in April 26, to April 27, 2014.

Table (2)
The arithmetic mean and standard deviation of learning styles

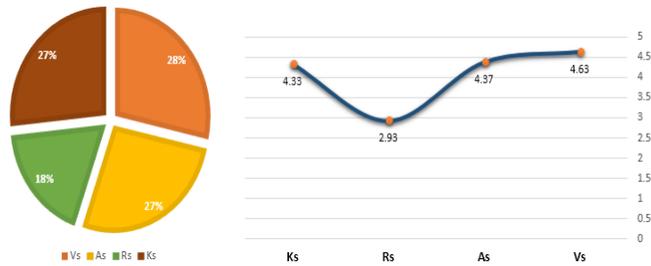| Learning styles	The experimental group			The control group			The sample as a whole		
	Mean	Std. Deviation	Skewness	Mean	Std. Deviation	Skewness	Mean	Std. Deviation	Skewness
Vs	4.52	1.855	-.482-	4.74	1.657	-.659-	4.63	1.743	-.558-
As	4.17	1.723	.173	4.57	1.701	-.699-	4.37	1.704	-.245-
Rs	2.91	.848	.664	2.96	1.147	2.070	2.93	.998	1.679
Ks	4.35	1.402	.288	4.30	1.550	.001	4.33	1.461	.115

Figure 1

Learning styles for study participants

Shown in Table (2), figure (1) that the averages of learning styles of the study sample was the highest value for visual style, then the audio style, and then kinetic style, the lowest value was for the reading / written style.

Table (3)

Significant differences between pre and post measurements for the experimental group in cognitive achievement and skill performance

	Pre test		Post test			Sig. (2-tailed)
	Mean	Std. Deviation	Mean	Std. Deviation	t	
skill performance	7.565	1.0369	12.565	1.0369	-21.255-	.000
Cognitive achievement	13.00	2.780	25.04	3.937	-27.513-	.000

It is seen from the table that there are statistically significant differences between pre and post measurements for the experimental group in each of the skill performance and cognitive achievement.

Table (4)

Significant differences between pre and post measurements for control group in cognitive achievement and skill performance

	Pre test		Post test			Sig. (2-tailed)
	Mean	Std. Deviation	Mean	Std. Deviation	t	
skill performance	7.870	1.1795	11.957	1.0757	-15.468-	.000
Cognitive achievement	12.61	2.709	22.43	3.578	-22.181-	.000

It is seen from the table that there are statistically significant differences between pre and post measurements for control group in each of the skill performance and cognitive achievement.

Table (5)

Significant differences between the experimental and control groups in the post measurement in cognitive achievement and skill performance

	The experimental group		The control group			Sig. (2-tailed)
	Mean	**Std. Deviation**	**Mean**	**Std. Deviation**	**t**	
skill performance	12.565	1.0369	11.957	1.0757	1.945	.057
Cognitive achievement	25.04	3.937	22.43	3.578	2.352	.023

It is seen from the table that there are a statistically significant differences in the post measurement between the experimental and control group in cognitive achievement level, and non-statistically significant in skill performance.

Discussion

The learning styles preferred by the sample appeared to be the visual, auditory and kinesthetic. The majority of the students (93.48%) demonstrated the use of more than one major preferred learning style.

The researcher believes that the identification of the learning styles of students is very important for each of the curriculum planners and teaching staff. "**Tlavha and Zglul**" (**2009**) Indicates that identify the learning styles contribute to the rebuilding, curriculum design, and selection of content, experiences, teaching methods and tools in proportion to the diversity of the different learning styles of learners (22). And it is consistent with the recommended by "**Sywelem, m & Dahawy, B**." (**2010**): that we need to be aware of learning styles of the students, evaluate styles and identify the learning styles preferences because it would enhance the foundations of learning.

The results of tables (3) and (4) There are significant differences between pre and post measurements for both the experimental and control group in each of the skill performance and cognitive achievement in favor of the post measurement, And the rate of change in the skill performance of the experimental group 39.79%, while the control group 34.18%, and the rate of change of cognitive achievement for experimental group 48.08%, while the control group 43.78%, it shows that all of the mind maps and traditional method has a positive impact on each level of cognitive achievement and skills performance of the students.

Table (5) also shows that there is statistically significant differences between the experimental and control groups in the post measurement of cognitive achievement for the experimental group and non-statistically significant for skill performance. And researcher attributed the absence of statistically significant differences between the experimental group and control group in the post measurement of skill performance to the variety of teaching methods in the traditional way such as visual, audio and motor displays which is suitable for the study sample favorite styles, while the existence of statistically significant differences between the experimental and control groups in the post measurement of the cognitive achievement due to the use of mind maps in learning, where mind mapping encourages whole brain thinking as it brings together a wide range of cortical skills from logical and numerical to creative and special. The overlap of such skills makes brain more synergetic and maintains brain's optimal working level. Keeping these cortical skills isolated from one another does not help brain development which the Mind Map seeks to do.

The use of keywords triggers connections in brain and allows to remember a larger quantity of information. This is supported by "**Farrand, Hussain and Hennessey**" (**2002**) who found that medical students who adopted Mind Mapping experienced a 10%

increase in their long-term memory of factual information. And where that visual style is the preferred among the study sample, so the use of mind maps have positively effect on the cognitive achievement level more than traditional teaching methods that depends on teacher explaining, Where the use of educational strategies that take into account the prevalent learning styles among students and their preferences when teaching, positively affecting the level of cognitive achievement, and it is consistent with the results of "**Tulaimat, Ghazi**" (**2008**) study, which reached the presence of statistically significant differences in the positive direction of the level of cognitive achievement when taking into account the learning styles of the students and their preferences when teaching. The researcher also attributed the presence of significant differences between the experimental and control groups for the post measurement in the level of cognitive achievement, and non-statistically significant for the level of skill performance, that the use of mind maps is more effective on the

theoretical material as "**Farrand, Hussain and Hennessey**" (**2002**) pointed out that mind maps provide an effective study technique when applied to written material (11).

And it emphasizes the importance of diversity in teaching strategies through diversification of activities and teaching methods to suit all the learning styles, where researcher confirms necessity for the inclusion of curriculum activities suit all learning styles of students and this, as recommended by each of "**Akl and Mahmoud**" (**2006**),"**El Shohary**" (**2009**), "**Rawashdeh, et all**.," (**2010**), "**Abu Elnady**" (**2010**), "**Helan, et all**.," (**2010**), in addition to what referred to by "**Smith and Renzulli**" (**1984**) that stress, frustration, and burnout may occur when students are subjected over extended periods of time to teaching styles inconsistent with their learning style preferences.

Conclusions

Based on results of this study, the following conclusions can be drawn:

1. The learning styles preferred by the sample

appeared to be the visual, auditory and kinesthetic.

2. The majority of the students (93.48%) demonstrated the use of more than one major preferred learning style.

3. The use of mind maps positively effected on the cognitive achievement level while not affected the skill performance level of the sample of the study.

Recommendations

Based on the aims of the study and the collected data, the following implications can be made:

1. Identify the characteristic of learning styles for learners and consider when choosing activities and teaching methods.

2. Use mind maps in teaching fencing to students in faculties of Physical Education.

3. Development a variety of teaching methods that take into account all the learning styles of students.

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