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"It's easy to learn from movement": learning through the Eshkol-Wachman Movement Notation (EWMN)

"Este uşor să înveţi din mişcare": învăţarea prin sistemul de notaţie Eshkol-Wachman (EWMN)

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Abstract

Background. Studies exploring the relation between human body movement and learners' achievements show that movement activity facilitates the internalization of learning concepts. The article draws on the rationale that bodily-kinesthetic intelligence in learning can be analyzed and opportunities for combining this intelligence with other intelligences can be explored to corroborate the contribution of integrating movement in teaching. The Eshkol-Wachman Movement Notation (EWMN) is a language based on an analytical method defining units necessary for describing the human body in space and time.

Aims. The objectives of the research were to implement an intervention program, using EWMN, in teaching two geometry topics: angles and symmetries, and to examine whether learning by an intervention program will improve knowledge of these two subjects.

Methods. 121 pupils participated in the study (N = 121) from four classes: two 3rd grades and two 4th grades, two experimental groups and two control groups. A knowledge test questionnaire from the Israeli Ministry of Education was conducted to examine the movement intervention program by means of EWMN. Statistical analysis of data was performed using SPSS.

Results. The experimental groups that learnt the topics through EWMN had significantly better academic achievements (M=71.92; SD=22.73) than the control groups who studied by the usual method prevalent today (M=60.49; SD=20.01). This difference was significant: P<0.01 (F (1.117) =9.67, P<0.01).

Conclusion. EWMN allows the illustration of the theory through conscious movement of the human body and through creative processes, thus promoting the learning of the two subjects.

Keywords: EWMN, movement learning, angles, symmetries.

Rezumat

Premize. Studiul prezentat se referă la explorarea relaţiei dintre mişcarea corpului uman şi realizările elevilor. Cercetarea arată că activitatea motrică, mişcarea, facilitează internalizarea unor concepte de învăţare. Articolul se bazează pe raţionamentul că putem analiza atât locul inteligenţei corporal-kinestezice în procesul de învăţare, cât şi capacitatea de a explora oportunităţile pentru combinarea acestei informaţii cu celelalte inteligenţe şi de a confirma contribuţia integrării mişcării în procesul de predare. Eshkol-Wachman Movement Notation (EWMN) este un limbaj bazat pe metode analitice privind definirea unităţilor necesare pentru a descrie corpul uman în spaţiu şi timp.

Obiective. Obiectivele cercetării au fost implementarea unui program de intervenţie, folosind EWMN, în predarea a două subiecte de geometrie, unghiuri şi simetrii, şi examinarea faptului dacă învăţarea unui program de intervenţie va îmbunătăţi cunoştinţele în predarea acestor două subiecte.

Metode. 121 de elevi au participat la studiu (N = 121) de la patru clase: două clase a treia şi două clase a patra, două grupuri experimentale şi două grupuri de control. Chestionarul de testare cunoştinţelor a fost realizat de către Ministerul Israelian al Educaţiei şi a fost realizat în vederea măsurării şi examinării programului de intervenţie a mişcării prin intermediul EWMN. Analiza statistică a datelor a fost efectuată cu ajutorul programului SPSS.

Rezultate. Grupurile experiment care au învăţat subiectele prin EWMN au avut realizări semnificativ mai bune academice (M = 71,92; SD = 22,73), comparativ cu grupurile de control care au studiat prin metoda predominantă astăzi (M = 60,49; SD = 20,01). Această diferenţă a fost evidenţiată cu un nivel de semnificaţie de P<0,01 (F (1,117) = 9,67, P<0,01).

Concluzii. EWMN permite ilustrarea unui teme teoretice prin mişcarea conştientă a corpului uman şi prin procesele de creaţie. Se promovează astfel învăţarea celor două subiecte, unghiuri şi simetrii, prin folosirea sistemului EWMN, care uşurează învăţarea.

Cuvinte cheie: EWMN, învăţarea mişcării, unghiuri, simetrii.

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Introduction

Movement inside the womb gives us the first sensation of the world and the beginning of our experiences and knowledge of the laws of gravity. Each movement is a sensomotor event associated with the comprehension of the physical world, the world from which all new learning is derived. Movement stimulates and activates many of our mental capabilities. It combines and sets down information and new experiences in our nervous system and is essential to all the actions by means of which we embody and express learning, understanding and ourselves (Hanford, 2002).

Integrating movement in learning depends on the teachers' approach and willingness to create a stimulating environment for action in an open and supportive learning atmosphere. Jensen (2003) argues that for pupils, learning which integrates physical practice is easier to master, is better remembered and mostly creates positive experiences which might be internalized and recalled for a long time. This is applied learning which provides great sensory input to the brain. Thus, by performing movement assignments, pupils can express in an active, non-verbal manner the understanding of familiar or new learning material.

In all learning environments and opportunities, pupils are different from each other in their data absorption and processing. This differentiation in learning ways and processing and hence in learning styles is connected, among others, with the various intelligences which comprise them. In order to create a meaningful learning experience, pupils should be allowed to study in their own unique way which is related to their characteristics as well as the intelligences with which they are endowed (Cohen, 2007).

According to the multiple intelligences theory conceived by Gardner (1996), we can analyze the place of the bodily-kinesthetic intelligence in learning and explore options for combining this intelligence with the other intelligences in order to corroborate the contribution of integrating movement in teaching. Integrating movement in learning creates immediate conditions for active learning. Movement-integrated learning results in bodily pleasure. When such active learning is supported by a positive atmosphere and by setting a motor and cognitive challenge, the pupils' internal motivation is reinforced, creating a sense of inner reward (Segev-Tal & Galili, 2010).

When combined with theoretical learning, movement constitutes in the preparatory stage towards learning an exercise of delayed movement which does not mean lack of movement but control over the movement and preparation for the learning focus (Shoval, 2009).

The theory of experiencing *"mediated learning"* (Feuerstein, 1998), indicating the importance of education in creating the intelligence, is responsible for the development of thinking flexibility which guarantees that a stimulus will considerably affect people.

EWMN is a language based on an analytical method which defines the units necessary for describing the human body movement in space and time. The description is done in relation to a geographic-spherical "system of reference" and is written on a special text page representing the body structure (Eshkol & Harries, 2000).

Integrating EWMN in theoretical learning serves bodily-kinesthetic learning, logical-mathematical learning and spatial orientation and it is meaningful to pupils endowed with these intelligences. EWMN enables data structuring: close guidance towards a clear objective, learning a sequence, building movement structures and receiving feedback on accumulated knowledge. The learning is systematic, directed and adapted to pupils' level of knowledge. It is active, leading to thinking flexibility. Thus we can see that the theories conceived by Gardner, Feuerstein and Bruner support the intervention program, based on EWMN, explored in this study.

The intervention program

The intervention program integrates EWMN with two topics of geometry taken from the elementary school curriculum: angles and symmetries. This program was designed following studies and teachers' reports about the difficulties pupils encounter in the internalization of these topics. It was also based on studies illustrating a relation of movement which facilitates theoretical learning (Shoval, 2006) and on EWMN used as a thinking tool, which might help people to observe the movement of the human body (Al-Dor, 2004).

Our world is basically geometric and in order to understand and assess it we need spatial orientation. Developing spatial perception and spatial skills is a pragmatic and useful objective. The use of spatial intelligence is very essential to the development and improvement of young children's mathematical thinking competences (Fadalon & Patkin, 2012).

The Eshkol-Wachman Movement Notation (EWMN)

EWMN enables movement activities and experiences which engage, by their very nature, in the visual perception and spatial-kinesthetic perception as well as in grapho-motor functions and motor-visual coordination.

As its name implies, movement notation is a way of writing movements, similar to writing musical notes. EWMN was conceived in Israel and was first published in 1958 by the late Prof. Noa Eshkol and the late Prof. Avraham Wachman (Eshkol & Wachman, 1958). It is one of the four major international movement notations: Benesh, CMDN (Chinese movement notation), Lavan and Eshkol-Wachman Movement Notation.

The signs of EWMN consist of figures, letters and accepted graphical signs. By using the diversified combinations of the signs, one can describe directions, paths and any movement event which is visible and is written on a special manuscript page, representing the body structure (Eshkol & Harries, 2000). In EWMN, learning is conscious and creative thinking demonstrates the symbols of the language by a practical way of bodily movement. The notation is based on a conscious, controllable and measureable movement.

This is the mindful movement which services the theoretical learning process and which is performed as part of an activity leading to learning. In order to connect movement and learning, we should choose movements over which learners do not have automatic control. On the contrary, they have to make decisions in order to perform

them (Shoval, 2006).

The principles of EWMN can be used to disassemble bodily-movement events into basic components and symbolize these events in a limited system of agreed symbols. This facilitates a fruitful relation between movement and core skills of formal learning (reading, writing, calculus) (Sapir & Blum, 2002).

Below are the principles of EWMN which underpinned the intervention program:

1) *The movement of the body parts is circular*

Every part of the human body has a circular movement from the joint to which it is connected. The movement of every axis of a body part forms an angle in relation to the adjacent part. From any axis of a body part we can form a circle or part thereof. The starting position and movement of the body part can be viewed as forming the angle. Consequently, the topic of angles as part of a circle can be illustrated, understood and organically and naturally linked to movement lessons (Fig. 1).

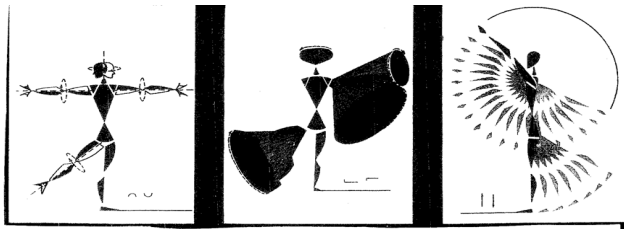


Fig. 1 – Drawn example of the circular movement of the human body (Eshkol & Harries, 1998).

A circle can be divided in different ways. In the division chosen for the intervention program of this study, one circle has 8 parts. Each part equals 45° and is referred to as one quantity (Fig. 2). This division is convenient for defining the movement of angles in people's life. For example: forward, backward and downward 180º or north-east 45º.

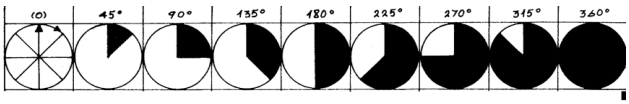


Fig. 2 – Movement quantity in EWMN (Eshkol & Shoshani, 1982).

2) *The system of reference of EWMN is called 'system of reference'*

This is a spherical system which exists in every joint. Body parts (joints) are similar to straight lines moving inside a sphere and therefore, their movement is circular. Space is divided into latitude lines - horizontal - and longitude lines - vertical - which create together a spherical system of reference. Thus, every body part wherever it is located is defined by a longitude line and a latitude line - position. The positions and movements of the body parts can be notated in a special manuscript page which is adapted to the structure of the human body (Fig. 3).

Angles and symmetries

Angles

An angle has a vertex from which two lines called legs are pointing. The length of the legs does not change the angle and has no effect on its size. Thus, every joint in the body is a vertex of an angle and the adjacent joints are its legs regardless of their length.

The angle size is determined according to the range between its two legs which have a common starting point. The angle name is given according to its size (Fig. 4):

- A straight angle is formed when the range between its two legs is 90 degrees and it makes a quarter of a whole rotation.
- An acute angle is formed when the range between its two legs is smaller than 90 degrees and the movement is less than a quarter of a whole rotation.

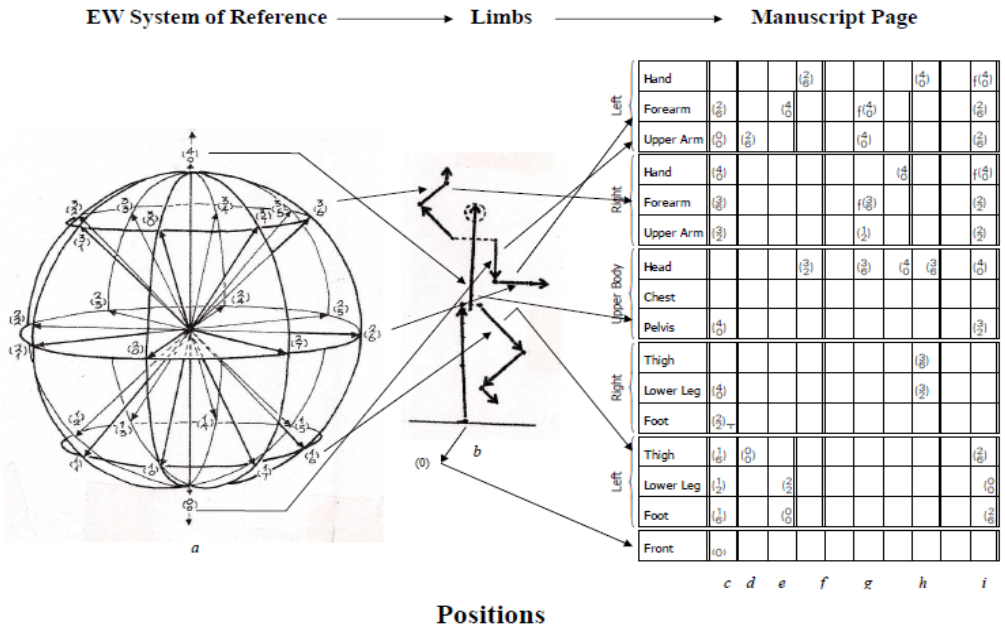
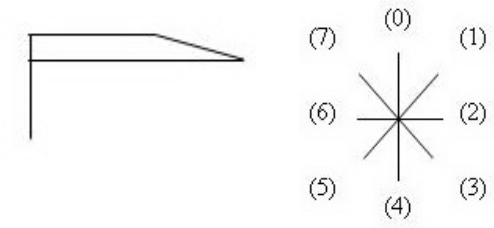


Fig. 3 – EWMN spherical system of reference, its connection to the human body, according to the manuscript page (Harries & Sapir, 2009).

Directions of the EWMN horizontal system



Step directions and locomotion											
Right leg	(0)	(0)		(0)		(2)		(3)		(6)	
Left leg	(0)		(0)		(0)		(2)		(6)		(6)
Angle type	–	–	straight	straight	straight	straight	straight	obtuse	acute	straight	straight

Fig. 4 – Step directions and locomotion in space on the topic of angles in EWMN.

- An obtuse angle is formed when the range between its legs is larger than 90 degrees and smaller than 180 degrees and the movement is between a quarter and a half of a whole rotation.

During the movement lessons by means of EWMN, the pupils distinguish and comprehend the topic of angles through writing, reading and movement of this language. The principles of the system of reference can be used for teaching the circular movements which form angles.

An example of movement teaching taken from the EWMN lesson on the topic of angles (Fig. 4):

- The following exercise relates to step directions and locomotion in space. All the pupils face direction (0). The teacher gives a direction (according to the horizontal system of EWMN) as well as the number of steps, and the pupils will walk according to the instructions. A total of 10 steps.

- The pupils will try to remember the created path, will guess what the drawing is and which angles are included in it.

- The pupils will write the step directions ((x) = step direction), will sketch the drawing and indicate the angles on the manuscript page.

Symmetries

The geometric basis of EWMN and the consolidation of its components into a coherent system with rules and regulations of its own link the world of movement to systems of concepts and symbols, which are studied at school. For example, reflection and rotational symmetries which can be defined by the system of reference (Fig. 5).

Reflection symmetry is a copy of the plane, defined by means of a straight line on the plane. Thus, each point on the plane is copied to a point on the other side of the straight line and at the same distance from it.

Rotation symmetry occurs when the center of the symmetry is such a point that a rotation smaller than a full rotation around it copies the shape on itself.

The natural given of extremities in the human body - two legs and two arms and the ability to move them – enables a view of rotational and reflection symmetry. The ability to advance in space while noticing the course of progress on the group – in each of the symmetry types – allows additional illustration of the topic and the understanding thereof.

Based on the spatial division of EWMN, the movement of the body parts in the two symmetry types can be examined.

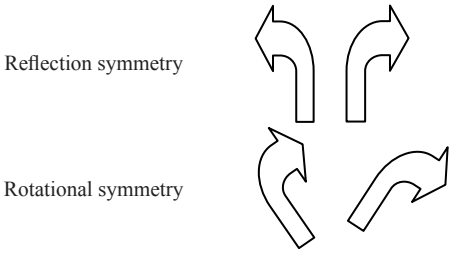


Fig. 5 – Reflection & rotational symmetry.

An example of movement teaching taken from the EWMN lesson on the topic of symmetries:

- The following exercise relates to step directions and locomotion in space.

Division into 4 pupil groups. Each group will compose together a locomotion path in different directions so that paths of reflection and rotational symmetry are formed between the group members. Every pupil will draw and write the directions in which he or she walked ((x) = step direction). A line from one point to another – is a step. Finally, the pupils will walk together the locomotion paths (Fig. 6).

Hypothesis

The intervention program, using the Eshkol-Wachman Movement Notation, will improve the level of knowledge of 3rd graders in the topic of angles and that of 4th graders in the topic of rotational and reflection symmetry, in relation to frontal teaching in class.

Material and methods

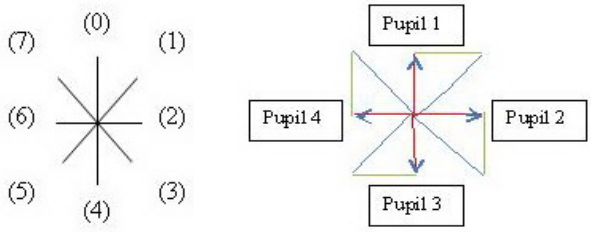
The study was approved by the Ethics Committees of the "Lev Ha'emek" Primary School, the principal, teachers and parents of pupils participating in the study. The ethical principles of confidentiality, anonymity and informed consent were applied to the study subjects.

Research protocol

a) *Period and place of the research*

The study was conducted as part of a three-year intervention program in the "Lev Ha'emek" Primary School, in the north of Israel.

Directions of the EWMN horizontal system



Pupil 1	R. leg	(0)	(0)		(2)		(5)				
	L. leg	(0)		(0)		(2)		(5)			
Pupil 2	R. leg	(2)	(2)		(4)		(7)				
	L. leg	(2)		(2)		(4)		(7)			
Pupil 3	R. leg	(4)	(4)		(6)		(1)				
	L. leg	(4)		(4)		(6)		(1)			
Pupil 4	R. leg	(6)	(6)		(0)		(3)				
	L. leg	(6)		(6)		(0)		(3)			
Symmetry type			Reflection		Rotational		Reflection				
			Step 1	Step 2	Step 3	Step 4	Step 5	Step 6			

Fig. 6 – Step directions and locomotion in space on the topic of symmetries in EWMN.

b) *Subjects and groups*

The present study consisted of an experiment in which 121 pupils from four classes participated: two 3rd grades and two 4th grades (Fig. 7). Each class had about 30 pupils. Two experimental groups: 3rd grade class A and 4th grade class A and two control groups: 3rd grade class B and 4th grade class B were chosen randomly as members of the two groups. Each class included boys and girls who had been learning EWMN from the 1st - 3rd grades.

A movement intervention program by means of EWMN was implemented, dealing with two geometry topics which have a direct relation to bodily movement. The movement of human body limbs is circular and, hence, the topic of angles was chosen. The body parts are symmetrical and reflection (upper and lower extremities) and, thus, the topic of "reflection symmetry" and "rotational symmetry" were chosen. The choice of two topics expands the research and allows checking the effect of the intervention program.

These geometry topics are studied according to the Israeli Ministry of Education curriculum. The 3rd graders and the 4th graders have these topics taught by the home-class teacher. Some of the lessons are given to the whole class and some of them to half the class. The same applies to the experimental and control groups, respectively.

The experimental group pupils, each class separately, studied with the movement teachers the movement lessons by means of EWMN according to the learning topics: the 3rd graders studied the topic of angles and the 4th graders studied the topic of reflection and rotational symmetry. The control groups, each grade separately with a teacher of its own – the home-class teacher – had lessons about the same geometry topics. The pupils sat on chairs – listened, read and wrote on the desk in front of them. They used notebooks and books of the "Simply Arithmetics" curriculum of the Israeli Ministry of Education (2008), without learning the topic through movement. The movement lessons of the experimental groups were parallel to the lessons of the control groups.

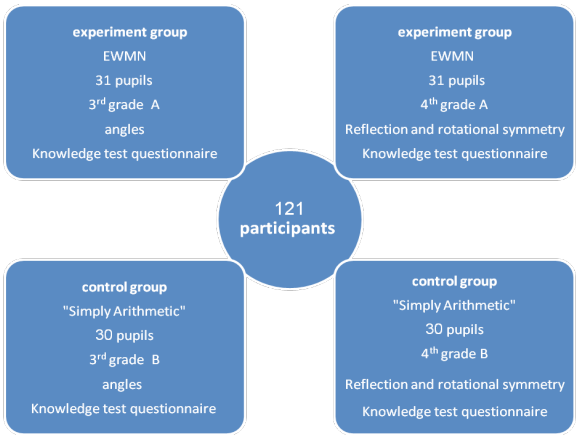


Fig. 7 – Research data.

c) *Tests applied*

At two points of time: before and after the experiment. The knowledge test questionnaire of the Israeli Ministry of Education examined the 3rd graders' level of knowledge on the topic of angles and the 4th graders' knowledge of the topic of rotational and reflection symmetry.

d) *Statistical processing*

In order to check whether a change occurred in the scores of the experimental group and the control group, a two ways ANOVA test was performed.

The variables between the subjects were the grades - 3rd grade or 4th grade and group affiliation - experimental group or control group. The variable among the subjects was the time of measurement (pre-study and post-study).

Results

Prior to the intervention program, the knowledge test questionnaire was administered. It showed that the pupils were not versed in the topics dealt with by the intervention program. The 3rd graders and 4th graders in both the experimental and the control groups did not understand the terms mentioned in the knowledge test questionnaire and hence failed to answer the questions. The learning material was new for them. The pupils in the four groups

demonstrated three patterns of answers in the knowledge tests prior to the intervention program:

- 52.3% of the pupils did not indicate any answer;
- 27.1% of the pupils wrote they had guessed the answers and they did not understand them or indicated all of them as correct;
- 12.2% of the pupils gave incorrect answers.

Following the intervention program, the knowledge test questionnaire was administered and the data were analyzed. Table I presents the means and standard deviation in the knowledge test questionnaire after conducting the study on the 3rd grade and 4th grade in both the experimental and the control groups.

Figure 8 illustrates a difference in the scores of the different affiliation groups (regardless of the grade - 3rd or 4th). The experimental group scored significantly higher (M=71.92; SD=22.73) than the control group (M=60.49; SD=20.01). This difference was on a significance level of $P<0.01$ ($F(1.117)=9.67$, $P<0.01$).

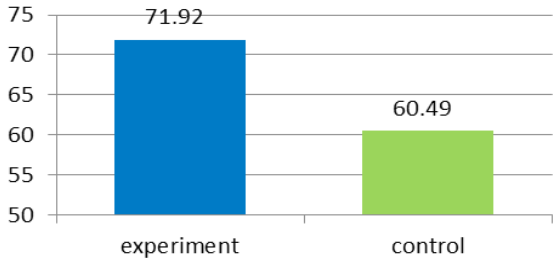


Fig. 8 – The difference in scores between the experimental and control groups (regardless of the grade - 3rd or 4th).

Figure 9 presents the data analysis following the intervention program by division into experimental groups and control groups in the 3rd grade and 4th grade. The scores of the experimental group are higher than the scores of the control group. That is, the knowledge test mean scores of the 3rd grade and 4th grade experimental groups were higher than those of the control groups following the intervention program.

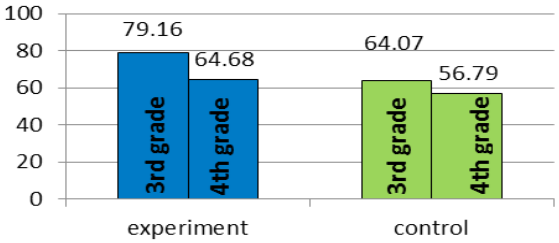


Fig. 9 – The difference in scores between the experimental and control groups according to the grade (3rd or 4th).

Discussion

The finding emerging from the study clearly shows that learning by means of an intervention program based on EWMN has indeed promoted the learning of a theoretical topic. According to the research findings, the attainments in geometry in the topic of angles and symmetries of the pupils who participated in the experimental group were higher than those of pupils who belonged to the control group.

This finding is in line with the theoretical rationale presented above. That is, the finding is supported by the 'mediating learning' theory of Feuerstein (1998), namely that intervention program is the mediator. The teacher uses the principles of mediating learning through EWMN for theoretical learning.

Moreover, this finding is corroborated by the 'Multiple Intelligences' theory (Gardner, 1996), putting an emphasis on three intelligences: bodily-kinesthetic intelligence, logical-mathematical intelligence and spatial intelligence. According to the MI theory, bodily-kinesthetic intelligence manifested by the pupils' ability to move and to learn the theoretical topics through body movement. Logical-mathematical intelligence manifested by the pupils' ability to cope successfully with analytical thinking and conclusion drawing when learning abstract geometrical topics. Spatial intelligence manifested by the pupils' ability to perceive accurately the visual-spatial world and to process the topic of angles and the topic of symmetries. In addition, this finding is supported by Bruner's 'knowledge construction' theory (Olson, 2007) since the use of movement and visual illustration by means of EWMN (Eshkol & Harries, 2000) allows implementing the acquired knowledge and linking the knowledge to other topics. These theories which underpinned the rationale of the intervention program created a synergy which enhanced the learning of theoretical topics - angles and symmetries – and brought about the expected results, namely an increase in pupils' attainments in geometry.

Conclusions

This finding illustrated the power embodied in learning through movement by means of EWMN which promotes theoretical learning. Herein resides the contribution of this study to knowledge in the field of education by movement.

The practical conclusions emerging from the discussion are as follows:

1. Elementary school pupils can better understand the topic of angles and the topic of symmetries through the body movement and by using the intelligences with which they are endowed and thus attain higher scores in these topics.

Table I

Means and standard deviations in the knowledge test questionnaire following the study on the 3rd grade and 4th grade in both the experimental groups and the control groups.

Total						4th grade						3rd grade					
Total N=121		E N=62		C N=59		Total N=50		E N=31		C N=29		Total N=61		E N=31		C N=30	
Std	M	Std	M	Std	M	Std	M	Std	M	Std	M	Std	M	Std	M	Std	M
22.06	54.89	22.73	71.92	20.01	60.49	15.66	59.95	16.56	63.35	14.02	56.31	25.73	71.74	25.44	79.16	24.10	64.07

Affiliation group: E (experimental group), C (control group). M (mean), STD (standard deviation).

2. The intervention program by means of EWMN which integrates movement, reading and writing can considerably improve the pupils' comprehension and higher scores in the topics of angles and symmetries.

Conflicts of interest

There are no conflicts of interest.

Acknowledgement

This paper uses partial results from the first author's ongoing PhD thesis carried out at Babes-Bolyai University, Faculty of Physical Education and Sport, Cluj-Napoca, Romania.

References

Al-Dor N. The impact of learning Eshkol-Wachman Movement Notation (EWMN) on the developing of coordination. Thesis Submitted in Partial Fulfillment of the Requirements for the Ph.D. Degree. Budapest: Eötvös Loránd University, 2004.

Cohen N. Multiple intelligences theory of Prof. Howard Gardner. Jerusalem: Branco-Weiss Institute, 2007.

Eshkol N, Harries JG. Movement Notation- part 2: The sphere of movement. Holon: The Movement Notation Society, 2000.

Eshkol N, Harries JG. Eshkol-Wachman Movement Notation: A Survey. Holon: The Movement Notation Society, 1998.

Eshkol N, Shoshani M. Movement Notation. Comparative Study of Labanotation and Eshkol-Wachman Movement Notation Part Two. Holon: The Movement Notation Society, 1982.

Eshkol N, Wachmann A. Movement notation. London: Weidenfeld and Nicholson, 1958.

Fadalon L, Patkin D. Developing spatial perception of boys and girls at the 3rd grade by means of an extra-curricular unit. Mispar Hazak, 2000(21), Haifa: University of Haifa, 2012, 31-36 [Hebrew].

Feuerstein R. Man as a Changing Entity. The International Center for the Promotion of Learning Ability. Tel Aviv: Ministry of Defence Publications, 1998 [Hebrew].

Gardner H. Theory of Multiple Intelligences from Theory to Practice. Jerusalem: Branco Weiss Institute, 1996.

Hanford K. Wisdom in movement. Why learning does not take place in our brain only. Nord publications, 2002; 99-104 [Hebrew].

Harries J, Sapir T. About Time in Eshkol-Wachman Movement Notation. Tel Aviv: Mayshav Ltd, 2009. [Hebrew].

Jensen A. Educate children according to their brain, implications of brain research on teaching and learning. Jerusalem: Branco Weiss Institute, 2003 [Hebrew].

Olson, D. Jerome Bruner: the cognitive revolution in educational theory. London & New York: Continuum. 2007.

Sapir T, Blum H. Improving basic learning abilities through movement and movement notation. Paper presented at the 4th international conference for teacher training, Achva Academic College, Israel, 2002.

Segev-Tal R, Galili R. Moves to learn. Integrating movement in the teaching of learning contents in kindergartens and first grades of elementary school. Tel Aviv: MOFET Institute, 2010;37-38 [Hebrew].

Shoval E. Moving and learning, body movement and its contribution to learning. Tel-Aviv: Ach Publishing House Ltd, 2006, 100-106 [Hebrew].

Shoval E. Relation between learning activities while moving and improving academic attainments in the topic of angles. Dapim. Tel Aviv: MOFET Institute, 2009, 185-211 [Hebrew].

***. Ministry of Education, Culture and Sport. Mathematics curriculum for the 1st - 6th grades for all sectors. Jerusalem: Ministry of Education, Culture and Sport, Pedagogical Secretariat, Section for the planning and development of curricula, 2008 [Hebrew].