Impact of Habits of Mind in Mathematical Creative Thinking at Amman Schools

أثر استخدام العادات العقلية في التفكير الإبداعي الرياضي لدى طلبة مدارس عمان

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Abstract

The study aimed at investigating the levels of habits of mind and their impact in the mathematical creative thinking at students of Amman schools. The sample of study consisted of (120) students selected from Eighth Basic Grade at Abu A'lia public school registered in the scholastic year (2015/2016). The sample of study was divided into two groups; the experimental group (n=60) trained the program of habits of mind, and the other a controlling group (n=60) (untrained by the training program). To investigate levels of habits of mind a scale of habits of mind was developed and had been assured of it is validity and reliability, also an instrument of processing had been developed, it is the training program on the mental habits, and also had been assured of it is validity. Results of study showed lowness of habits of mind at students, and excellence of the experimental group (trained by the training program in the habits of mind) on the controlling group in creative thinking, in addition to existence of positive connecting relationship between the level of habits of mind and mathematical creative thinking. And in the light of results of study, both researchers with the significance of using the training program in the habits of mind on developing the creative thinking.

Keywords: Habits of Mind, Creative Thinking, Mathematics.

ملخص

هدفت هذه الدراسة إلى تقصي مستويات العادات العقلية، وأثرها في التفكير الإبداعي الرياضي لدى طلبة مدارس عمان، وتكونت عينة الدراسة من 120 طالبا وطالبة من الصف الثامن الأساسي في مدرسة أبو عليا للذكور وأبو عليا للإناث والمسجلين في العام الدراسي 2016/2015م، وتم تقسيم عينة الدراسة إلى مجموعتين إحداهما تجريبية (60) طالباً (تدربت على برنامج تدريبي في العادات العقلية) والأخرى ضابطة (60) طالباً (لم تتدرب على البرنامج التدريبي). ولتقصي مستويات العادات العقلية تم تطوير مقياس في العادات العقلية، وتم التحقق من صدقه وثباته، وكذلك تم تطوير أداة المعالجة وهي البرنامج التدريبي على العادات العقلية، وكذلك تم التحقق من صدقه. وأظهرت نتائج الدراسة تدني مستوى العادات العقلية عند الطلبة، وتفوق المجموعة التجريبية (التي تدربت على البرنامج التدريبي في العادات العقلية) على المجموعة الضابطة في التفكير الإبداعي، إضافة إلى وجود علاقة ارتباطية موجبة بين مستوى العادات العقلية والتفكير الإبداعي الرياضي. وفي ضوء نتائج الدراسة يوصي الباحثان بأهمية استخدام البرامج التدريبية في العادات العقلية على تنمية التفكير الإبداعي.

الكلمات المفتاحية: العادات العقلية، التفكير الإبداعي، الرياضيات.

Introduction

Education at the present decade faces abundant challenges and problems mainly in the field of mathematics, represented in how to solve problems by creative thinking and modem methods.

Teaching mathematics is not limited to the development of cognitive aspects in terms of concepts, principles and theories, and algorithms, but also exceeds teaching and learning mathematics to form strongly mental processes, the development tendencies and emotional positive extensions, for example, are used as a language of communication, a technique of explanation proof thinking, problem solving (Obiad, 2004).

Students in Jordan suffer from difficulties in learning mathematics and skills of thinking, and there is a problem of how to study mathematics all by themselves, the research of (Masri et al, 2008) indicates that the achievement of Jordan students in TIMMS in 2007 decreases the international average. The report prepared by International Education Assessment (IEA, 2012) about achievement of Jordan students in TIMSS in 2011 shows decline of achievement, below average, and

calls for a review of methods of methods of study and teaching by using mentality and study the habits of challenge.

Teaching thinking is an educational goal since previous decades and is the main goal of teaching in general subjects now, especially mathematics that knows a mental process, develops the learner of the mental interaction between the learner and what acquires experiences; it aims at developing.

National Council of Teachers and Mathematics in United states of America (NCTM, 2000) confirms that thinking is considered one of the most important outcomes of teaching mathematics.

The creative thinking is a new trend in education, that can be, achieved by training on the high mental activities during problem solving, and benefiting from technology strategies in creative thinking (Jarwan, 2002).

Creative thinking is known as a mental process through which solutions of problems are found in production and generate genuine ideas and multiple ways (Abujado & Nofal, 2007).

Regarding stages of the creative process, many scientists (Sutinan, Chalard, & Pattananusorn, 2013) have distinguished four stages of the creative activity:

1. **Preparation**, which is the initial phase of preliminary work: collecting data and information, searching for related ideas, and listening to suggestions.
2. **Incubation**, which is the delay between preparation and the moment of insight; during this time the prepared material is internally elaborated and organized
3. **Insight**, which is the subjective experience of having the idea–the "aha" or "eureka" moment.
4. **Verification**, includes two sub-stages: evaluation of the worth of the insight, and elaboration into its complete form

The skills of creative thinking as stated by (Jarwan, 2002) are: **Fluency**: the ability to produce or generate a large number of good ideas or correct the problem with open ended, **Flexibility**: the ability to generate a variety of ideas and un-expected ones. **Originality**: the ability to produce a unique and authentic idea more than the common or expected ideas. **Sensitivity to the problems**: the ability to detect problems and the discovery of their lack of information. **Details**: the ability to provide additions or increases to the idea.

Most educational systems go in the modern era to a wider basic education. So they worked to make scholars of education try different methods to teach thinking skills, including these modalities and methods. A variety of cognitive training leads to production of instant gains in performance. But individuals stop using cognitive techniques, they learned specified conditions for training, and were able to perform a cognitive skill by education and training, but they have not acquired any general use, or ability to judge for themselves when to be around these cognitive usefulness technique, their upon, the researchers began interesting strategies concerned with creating an environment that encourages students on thinking, and training on basic proficiency and thinking skills, that lead to formation of habits of mind (Swartz & Parks, 1994). Habits of the mind are a set of skills that learners must have rehearsed positively, enables them to think and find solutions of problems easily, so that learners can be trained flexibility on mental habits (Costa, 2000).

The Habits of Mind are an identified set of 16 problem solving, life related skills, necessary to effectively operate in society and promote strategic reasoning, insightfulness, perseverance, creativity and craftsmanship. Understanding and application of these 16 Habits of Mind serve to provide the individual with skills to work through real life situations that equip that person to respond using awareness (cues), thought, and intentional strategy to gain a positive outcome.

Teaching habits of mind interested in how students behave when they do not know the answer, observing how students produce knowledge rather than how they merely reproduce it. A critical attribute

of intelligent human beings is not only having information, but also knowing how to act it (Costa & Kallick, 2000).

Students (Costa & Kallick, 2000) often expend great amounts of energy to figure out teachers intensions in classrooms where the habits of mind succeed, teachers make one intention explicit mastering the habits of mind is the goal of students education, also help students see the responsibility for thinking is theirs.

Students grasp that mastering the habits of mind is a classroom goal when thinking becomes the content. They come to understand that having more than one solution to a problem is desirable; they see that it is commendable when they take time to plan for and reflect on an answer rather than respond impulsively. They also learn that it is desirable to change an answer with additional information (Richards, 2007).

Mainly we look when teaching mathematics, the behavior called persistence, it means, as people never give up, as Thomas Alva Edison Method for exploring the knowledge depends on the trial and error, and we learn from Edison the way for successes, the diligence and patience.

Educational outcomes in traditional settings focus on how many answers a student knows. When we teach the Habits of Mind, we are also interested, in how students behave when they do not know an answer. The Habits of Mind are performed in response to questions and problems, the answers that are not immediately known. We are interested in enhancing the ways students produce knowledge rather than how they merely reproduce it. We want students to learn how to develop a critical stance with their work: inquiring, editing, thinking flexibly, and learning from another person's perspective. The critical attribute of intelligent human beings is not only having information, but also knowing how to act on it.

What behavior indicates an efficient, effective thinker? What do human beings do when they behave intelligently? Vast research on effective thinking, successful people, and intelligent behavior by Ames (1997), Carnegie and Stynes (2006), Ennis (1991), Feuerstein, Rand, Hoffman, and Miller (1980), Freeley (as reported in Strugatch, 2004),

Glatthorn & Baron (1991), Goleman (1995), Perkins (1991), Sternberg (1984), and Waugh (2005) suggests that effective thinkers and peak performers have identifiable characteristics. These characteristics have been identified in successful people in all walks of life: lawyers, mechanics, teachers, entrepreneurs, salespeople, physicians, athletes, entertainers, leaders, parents, scientists, artists, teachers, and mathematicians.

Horace Mann, a U.S. educator (1796–1859), once observed that "habit is a cable; we weave a thread of it each day, and at last we cannot break it." In learning and leading with habits of mind, we focus on 16 Habits of Mind that teachers and parents can teach, cultivate, observe, and assess. The intent is to help students get into the habit of behaving intelligently. A habit of mind is a pattern of intellectual behavior that leads to productive actions. When we experience dichotomies, are confused by dilemmas, or come face-to-face with uncertainties, our most effective response requires drawing forth certain patterns of intellectual behavior. When we draw upon these intellectual resources, the results are more powerful, of higher quality, and of greater significance than if we fail to employ such patterns of intellectual behavior (Costa, 2000).

A habit of mind is a composite of many skills, attitudes, cues, past experiences, and proclivities. It means that we value one pattern of intellectual behavior over another; therefore, it implies making choices about which patterns we should use at a certain time. It includes sensitivity to the contextual cues that signal that a particular circumstance is a time when applying a certain pattern would be useful and appropriate. It requires a level of skillfulness to use, carry out, and sustain the behavior effectively. It suggests that after each experience in which this behavior is used, the effect of this use is reflected upon, evaluated, modified, and carried forth to future applications (Costa, 1991).

There are many studies interested in mental habits as outcomes of learners and teaching habits of mind for example the study of (Minsung & Robert, 2013) identified five sub dimensions of spatial habits of mind: pattern recognition, spatial description visualization, spatial concept use,

and spatial tool use, and created an inventory to measure them. In addition, the effects of GIS learning on spatial habits of mind were investigated. Pre-and post-tests were conducted at the beginning and end of a semester-long GIS course. The results suggest that the inventory is a reliable and valid instrument for measuring spatial habits of mind. Analysis of student responses revealed that completion of a GIS course enhanced their spatial habits of mind. It is believed that this research is relevant to a wide range of disciplines whose practitioners are interested in spatial literacy.

In addition, a study of (Gooden & Xchase, 2015) educational partnerships between urban school districts and institutions of higher education provide a powerful means for enhancing student achievement and cultivating college-going cultures. This article describes how Boston University and the Malden, Massachusetts, school district worked with the community to support English learners and develop a curriculum around five "habits of mind." The five habits of mind are: (1) Integrated Curriculum; (2) Socio-emotional Learning: Building Successful Character; (3) Intercultural Awareness and Competence Development; (4) Integration of the Arts; and (5) Role Models.

And study of (Muammer & Richard, 2013) the study investigated elementary student teachers' scientific habits of mind for a series of socio scientific issues, and compared their views with respect to academic performance and type of program. The sample consisted of 1,600 student teachers from science education, mathematics education, primary teacher education and social science education programmer (100 student teachers from each grade) at a university in Turkish in the fall semester of the 2010–2011 school year. The data were obtained from the Scientific Habits of Mind survey consisting of (32) items which had been previously validated, in this setting. The findings suggested that the teacher education programmers need to help student teachers grasp better scientific thinking as measured via scientific habits of mind if they are to engage more effectively in decision-making and discussion of socio scientific issues in their classrooms.

The study of (Kose &Tansili, 2014) attempts to determine primary school teachers' geometric habits of mind Participants were 57 primary school teacher candidates in their third year studying Primary School Education in a Faculty of Education at a state university in Turkey, the results showed that the primary school teacher candidates did not possess different ways of thinking about the components indicating geometric habits of mind. The study also found that the candidates could not analyze the given problems appropriately and acted on the first idea they came up with, but they were unable to apply these actions on the problem and, therefore, their geometric habits of mind were not at the desired.

A study of (Cuoco, Goldbenberg, & Mark, 2010) discussed the implementation of the habits of mind of high school curricula, using the center of mathematics project as a source of example, they found that using mathematical habits of mind as an organizer can bring genuine and often surprising coherence to a curriculum.

The study of (Korkmaz, Dundar, & Yaman, 2016) aimed at revealing the mathematical habits of mind which are observed on the teachers mathematics of serving at the public schools in turkey, the results showed that the teachers have different opinions on their mathematical habits of mind and the majority of them think that habits of mind are effective both inside and outside the class.

And about programs used to develop and improve habits of mind the research of (Charbonneau& others, 2009) demonstrated how popular culture and mystery can be used to motivate students, and they offer an approach to assessing the work ethic efforts at United States military academy .

Questions of the study

The study aims at in the following questions:

1. What is the level of mental habits in students of Amman schools?
2. What is the effect of using training program in the habits of mind of creative thinking in mathematics?

3. Is there a correlation between the level of mental habits and creative thinking in mathematics?

Importance of study: The importance of study conceals in the need to adopt the creative thinking as one of the standards of (NCTM) in Education, and learning mathematics (NCTM, 2000).

The importance of this study also stems from the importance of teaching strategy, like using habits of mind as a teaching strategy, very important for teachers and students with the help of new programs that offer a great opportunity for students to participate, extrapolate information, and reach results.

This study provides models of math lessons in the subject of the geometry for teachers in both private and public education programs, to take them into consideration when teaching math topics and perhaps this strategy helps teachers in math education in public and private education schools.

Limitations of study

- Skills of creative thinking (originality, fluency, flexibility).
- The subjects of study Abu A'lia school for girls and Abu A'lia School for boys in 2015/2016 year.

Methodology of study: the quasi experimental method in the present study had been used, for the sample of the study divided in tow groups; one of them both experimental and the other group is controlling, and equivalence had been assured between both groups, at the level of previous obtainment.

Subjects: The sample of study consisted of 120 students from Basic Eighth Grade students for the academic year 2015/2015 enrolled in the first semester 2015/2016 at the school of Abuallia Pearl, in Amman strip, the sample is divided into two groups: the experimental group consisted of (60) students, (29) males and (31) females, and the controlling group consisted of (60) students, (32) males and 28 females.

Tools of the study

1. Habits of the mind Scale

To measure the habits of the mind levels of students in Amman strip, the researchers develop Likert scale of 16 subskills of the habits of mind which are: persisting, managing impulsivity, listening with understanding and empathy, Thinking flexibly, thinking about thinking(Metacognition), striving for accuracy, questioning and posing problems, applying past knowledge to new situations, thinking and communicating with clarity and precision, gathering data through all senses, creating, Imagining, innovating, responding with wonderment and awe, taking responsible risks, finding humor, thinking interdependently, and remaining 0pen to continuous learning.

The reliability was tested by applying it to the exploratory sample (of the study subjects) using the internal consistency of the test paragraphs, and the coefficient of reliability was calculated using Cronbach's Alpha Equation (α), where it was (0.87).

2. Creative thinking scale of Mathematics

Creative thinking test: the test consisted of 27 paragraphs distributed into three domains: originality (9), fluency (9), flexibility (9) Ability of creative thinking scale of mathematics, the Preparation of Ability of creative thinking scale passed through the following steps:

a. Access to the theoretical literature on the creative thinking, and to translate the concept of the ability of creative thinking and its domain: Fluency, Flexibility, Originality represented in the application of concepts, principles, and skills, related to the geometry and numbers in many different and new situations, where the student does not see a clear path to a solution.

b. Preparation of the test items, which are 27 as mentioned before, about creative thinking domains: Fluency, Flexibility, and Originality.

To check the validity, the test was submitted to a group of arbitrators specialists and experts in the domain of methods of teaching

mathematics, some items were modified and some were deleted in light of observations.

The reliability was tested by applying it to the exploratory sample (of the study subjects) using the internal consistency of the test items, and reliability coefficient was calculated using Cronbach's Alpha Equation (α), where it was (0.80).

Procedures of study: this study has passed the following actions:

a. Access to the theoretical literature on the use of habits of mind, creative thinking and the employed methods in teaching mathematics.

b. Training on teachers about habits of mind.

c. Prepare the habits of mind scale, and creative thinking scale, presented to the judgments, and applied on a survey sample to determine validity and reliability.

d. Choosing the sample of the study in a deliberate manner and randomly divided into two groups: one is controlling and the other is experimental and verify equivalence between them both in terms of variables, such as: the previous achievement in mathematics during the previous school year.

e. Teacher training / parameter-based process of teaching students the experimental group on the use of habits of mind program.

f. Teaching the unit of geometry and numbers for the students of the experimental group with the help of habits of mind program using manual, and displaying various examples of the teacher on educational situations to use the habits of mind and teaching at the same time for students in the controlling group using the traditional method of teaching.

g. Apply both of the post habits of mind scale, and post creative thinking scale on the experimental and controlling group's students.

I. Analysis of the results of study.

II. Provide suggestions and recommendations.

Variables of the study

Independent variable: the teaching method has two levels :(training strategy using habits of mind program, and the traditional method of teaching).

Dependent variables: dependent variables in this study are: habits of mind, and creative thinking.

Statistical treatments: to answer the questions of study, arithmetic means, standard deviations, correlation, and (ANCOVA) were used.

Results

To answer the 1st question which is

1. What is the level of habits of mind at students Amman schools?

The researchers used the descriptive statistics. Table (1) shows the arithmetic means and standard deviation:

The table below shows the descriptive statistics of habits of (16) mind habits:

Table (1): Arithmetic means and standard deviations of mind habits in ascending arrangement at students of Amman schools.

The subskills of habits of mind	Mean	SD
Applying past knowledge	18.93	6.38
Managing impulsively	18.94	6.17
Finding humor	19.07	6.42
Persisting	19.12	6.57
Questioning and posting in problems	19.43	5.83
Taking responsibilities	19.46	6.05
Thinking and communicating	19.46	6.34
Creating, imaging	19.79	6.03
Thinking interdependently	19.88	5.95
Responding	19.97	5.90

... Continue table (1)

The subskills of habits of mind	Mean	SD
Gathering data through all senses	19.98	6.43
Listening and understanding	20.06	6.31
Remaining open continues	20.99	5.96
Thinking flexibility	21.03	6.16
striving of accuracy	21.11	5.41
Thinking about thinking	21.39	6.08
All	**54.08**	**15.52**

Notes from the above-mentioned table that the level of mind habits generally hits (54.08), which is a weak ratio, levels came in ascending order from least to the use of the information above to the top and is thinking about thinking and as percentages are all weak. This indicates that low levels of mental habits in general and the lack of interest of the student, while solving mathematical problems, as well as by observing the standard deviation values, where the significant difference between the groups of students was not suggesting homogeneity of students in the back of mind to have.

So that we can conclude that the level of mind habits in students is very weak and may be the effects of students achievement was weak, the students didn't have any training on habits of mind, and the program be taught of mind habits must teach for teachers and students at Amman schools.

And to answer the 2nd question which is:

2. What is the effect of using a training program based on the habits of mind on creative thinking in mathematics?

The researchers used the descriptive statistics and ANCOVA test and the following table shows the means and standard deviation for experimental and control groups:

Table (2): Arithmetic means and standard deviations for students grades in creative thinking in both the experimental and controlling groups.

Group	sex	Mean	SD	N
experimental	male	80.27	11.95	30
	female	70.10	12.00	30
	Total	75.18	84.35	60
controlling	male	54.22	16.96	32
	female	42.14	12.06	28
	Total	48.58	15.96	60
Total	male	66.82	84.30	62
	female	56.60	18.46	58
	Total	61.88	61.91	120

The researchers notice from the above mentioned table that the arithmetic mean in the creative thinking of the experimental group was (57.18) and higher than the arithmetic mean of the controlling group (48.58), and the arithmetic mean of the males in the experimental group (80.27) is higher than the arithmetic mean of the males in the controlling group (54.22), also notice the superiority of females of the experimental group, where the average (70.1) on the controlling group, where the average is (42.14).

To explore the significance of differences between the arithmetic means of the experimental group and controlling group student's signs in the creative thinking ability used covariant analysis (ANCOVA), as shown as follows in the table:

Table (3): Analysis of covariance (ANCOVA) results of significance differences between means of creative thinking groups.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Group	21825.38	1	21825.38	5.87	.017*	.048
Sex	3702.22	1	3702.22	1.00	0.32	.009
group * sex	27.23	1	27.28	0.01	0.93	.000
Error	431159.46	116	3716.89			
Corrected Total	456114.37	119				

* Significance at ($\alpha \leq 0.05$).

The results in table (3) indicate the existence of a statistically significant impact of the variable group ($f = 5.872$, $\alpha = 0.017$) in favor of the experimental group used the training program in habits of the mind, so there is no impact of the variable sex ($f = 0.996$, $\alpha = 0.32$), and there is no impact of the interaction between the group and gender ($P = 0.007$, $\alpha = 0.932$).

This result is attributable to the training program habits of the mind in the creative thinking ability, even so the program of training provides students the ability to solve problems through trails and the program provides the humor and thinking flexibility.

The habits of the mind program which was built considering the 16 habits of mind, that help students how to solve problems by various ways, create new methods for solving problems, and increase the motivation through finding humor and persistence.

The habits of mind technique (Costa & Kallick, 2000) of intellectual behavior leads to acts of productivity, as defined by Costa, as a combination of a lot of skills, attitudes, hints, past experience and trends.

This is provided by a training program, The program is a kind of training including a lot of educational situations that develop skills of thinking and learning outcomes in general. One of the new trends in education seen as a product of the mental habits of education achieve many educational goals.

Marazano confirms (Marazano, 2000) the dimensions of learning as considered one of its dimensions, as defined in self-regulation, critical thinking, creative thinking is similar to mental habits set by Costa, which both emphasize the preparation of an educational program develops the individual behavior, thinking and raises motivation, emphasizes education planning and monitoring.

Costa is the individual (Costa & Kallick, 2000) who acts intelligently and able to think in subtlety this confirms the strength of the connection between theory and smart behavioral and the thinking skills in the process of teaching at the classroom. This confirms the strong connection between the training habits of mind produced and their impact on creative thinking, relationship between mental habits and thinking skills is hierarchical, Educating the individual with thinking skills such as memory, classification, analysis, reasoning and generalization lead to a cognitive process such as problem solving and decision making.

This in turn leads to teach mental habit tendencies that description and interpretation of this are consistent with the impact of the development of creative thinking and skills.

Presumably Costa's latent capacity can bring out the smart behavior through emotions, motivations, sensitivities and values provided in the training program based on habits of mind that taking into account individual differences among learners. How much did Costa suggest to teachers to develop mental habits while individuals are the product of education in various courses.

It is noted that the mental habits set by Costa focused on the following three areas:

a. The development of thinking flexibly and interactively, and thinking in the development of character skills, creativity, and visualization. These skills develop creative thinking skill fluency, flexibility and originality.

b. Increase the motivation of learners by finding humor, curiosity, thrill and joy.

c. The development of the social aspects through interaction with others and the ability to communicate with others and the development of their ideas.

To answer the 3rd question which is:

3. Is there a correlation between the level of mental habits and creative thinking in mathematics?

By using the analysis of ANOVA to show the significance of correlation between the levels of mind habits and creative thinking ability. The table below shows the significance of correlation:

Table (4): Analysis of variance (ANOVA) results of significance correlation between habits of mind and creative thinking groups.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	52778.45	1	52778.45	15.44	0.0001
	Residual	403335.92	118	3418.10		
	Total	456114.37	119			

We notice from the table (4) that there is a positive relationship between the habits of mind and mathematical creative thinking with significance ($F = 15.44$, $\alpha = 0.0001$).

Which mean that in order to increase mathematical thinking we must increase the habits of the mind.

And to find a mathematical model represents the relationship between habits of mind and creative thinking for students. The following table shows the coefficients:

Table (5): Coefficients of equation regression.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-11.467	19.415		-.591	.556
Habits of mind	1.356	.345	0.34	3.929	.000

Form the previous table we can conclude the following equation Regression equation: The creative thinking = 1.356 (habits of mind) - 11.467. And we can predict the mathematical creative thinking ability from the habits of mind at Amman schools.

Seeking educational institutions in countries of the world to find programs develop creative thinking, for example, a project at Purdue University to develop the creative abilities of primary school pupils. The project provides lessons to improve the innovative capacity through ideas and principles that lead to improve the innovative capacity as well as the stories of scientists and innovators. This underlines the importance of providing resources and educational programs that foster creative thinking and study the relations between the variables that develop creative thinking. The study and its impact have been studying the relationship between mental habits as an independent variable on the dependent variable which is a creative thinking. The relationship was a direct correlation it is positive, i.e. to increase creative thinking, we train students on produced mental habits.

The math curriculum is a field of fertile ground for training on different ways of thinking, by the nature of the math formula, where the sports content provides multiple ways to solve mathematical problems, as well as provide opportunities for the development of creativity and innovation, for mathematics encourage creativity and originality as educated teachers do through the provision of educational programs.

Recommendations

In light of results, the researchers recommend:

1. Training teachers to use habits of mind through subjects of mathematics.
2. Doing more researches on the impact of habits of mind in both critical, and geometrical thinking.
3. Use habits of mind in studying mathematics
4. Habits of mind increase creative thinking.

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