

Research Article**Thinking Styles of New Mathematics Teachers and their Relation to Self-Esteem***Yousef Mathkal Abd ALGANI¹  Amer HAJ² **Abstract**

The teacher's self-esteem affects his point of view, his thinking style, and his attitudes towards education. It also generally influences the teacher's behavior during the lesson session, his relationship with students, his teaching style, and also his expectations of the students as well as the decisions that he makes in his teaching plans. It can also have a significant impact on his students in developing their thinking style, and in helping students to overcome their educational difficulties and their fear of the subject they are studying. This research aims to determine the contribution of self-esteem in forecasting thinking styles among new mathematics teachers. The significance of this study is to determine the contribution of self-esteem in forecasting thinking styles in order to draw the attention of educators and researchers when preparing teacher training programs including their syllabus and the teaching material, because it will affect their performance and their students in the future. The researcher used the quantitative method and Thinking Styles Inventory to check the contribution of self-esteem in forecasting the thinking styles of the new mathematics teachers. The researcher will also use the Self-esteem scale to check the contribution of self-esteem in forecasting the thinking styles of the new mathematics teachers. The study sample consisted of 169 participants (79 males, 90 female): new mathematics teachers in Israel. The results show that the correlation coefficients between the legislative thinking style and self-esteem were significant (1.4%), and show that the correlation coefficients between the executive thinking style and self-esteem was significant at (2.8%).

Keywords: Mathematics, new teachers, self-esteem, thinking style**1. INTRODUCTION**

The phenomenon of human thinking is very complex because it includes all types of mental activity, or cognitive behaviour. The research in the field of human thinking has received great attention from scientists and philosophers, and has been addressed in different fields in many ways depending on the interest in each of those fields. Thinking is one of the most important processes that help the individual to function in his daily life. In addition to being a mental process, it reflects the different components that compose the personality structure, and appear in a particular lifestyle that distinguishes the individual. The individual's way of thinking is often determined by his or her way of life (Ciarrochi, Heaven & Davies, 2007). According to this growing interest in the phenomenon of thinking, some theories emerged which focused on the individuals' thinking styles used to deal with life problems. They reflected the individuals' favourite ways of thinking, which is irrespective of their abilities. So it is important to draw people to the type of education or profession commensurate with both their capabilities and their thinking styles (Brand, Felner, Seitsinger, Burns, & Bolton, 2008).

It is clear that theories and models of cognitive methods led to finding a link between capabilities and personalities. That the methods of thinking are one of the topics that psychologists have focused on in recent decades, trying to understand them, and study their nature and characteristics. Despite what has been written about thinking methods, there are still many educators and researchers in the field of psychology posing questions about the definition of methods, their

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impact on life, and the factors affecting them. Predictively, the significance of these questions seems to use the term 'method' in different ways, with different concepts and multiple perceptions. This can be presented and explained below.

Grigorenko and Sternberg (1995, 63) defined method as the preferred style or manner of doing something. More specifically, Grigorenko and Sternberg (1995) see that cognitive style is the "individual way of processing information". Thinking styles as one of the distinct variables in human behavior began to gain interest in the late fifties and increased in the early seventies, where many models and theories that discussed methods appeared. In 2006 the term 'intellectual style' emerged in Zhang research to describe "the individual's preferred method of processing information and dealing with tasks", a general term that appeared to include both cognitive, learning, and thinking styles. This term covers these concepts in the different attitudes related to it, which consider the individual's preferred cognitive method of processing information and perception, while the learning method is the individual's preferred method of learning information (Zhang, 2006; 2001).

This theory was introduced by Robert Sternberg (1988, p 28:30) and was then called the Theory of Thinking style in 1990. The main idea in this theory is that cognitive methods or methods of thinking are the method in which the individual controls the thoughts of his mind, and at the same time it is an internal mirror of the types of governments that this individual sees in the outside world. This theory is based on the assumption that the forms of governments existing in our world are not the same or represent a single pattern, but rather reflect or display the different methods that enable individuals to control their own methods of thinking, and Sternberg's theory is similar to the methods of thinking used by the governments or authorities that exist in any society. The parallels as presented in five dimensions in terms of functions, forms, levels, scopes, and leanings. In terms of the main functions of governments or authorities, they are three: legislative, executive, and judicial. The main forms of government are four: monarchic monarchy, hierarchical hierarchy, anarchic minority, and oligarchic anarchism. Also, governments have two levels: global and local. There are also two areas for governments: internal and external. Governments have two tendencies: conservative and liberal (Sternberg, 1988, 95). As presented by Sternberg, (1988) the methods of thinking are divided into five dimensions and thirteen styles of thinking. The first dimension, which is the function dimension, has three styles:

The legislative style: A student that has a legislative style has the tendency to do a task such as projects, situations and problem solving that require creativity and formulation and planning of ideas and strategies.

The executive style: A student that has an executive style has the tendency to do a task such as projects, situations and problem solving that provide him with a structure, procedures, or rules for dealing with them, and they can act, although adjustable, as guidelines for measuring progress. While a student with a legislative style likes to decide what to do and how to do it, an executive-style student often prefers to be told what to do, and then gives the best performance and doing it well.

The judicial style: A student with a judicial style has a penchant for tasks, projects, and situations that require evaluation, analysis, comparison, contrast, and judgment on existing ideas, strategies, projects, and the like. This student tends to rate others, sometimes on the basis of minimal information.

Now we will talk about the dimensions and the styles without elaborating their details.

The second dimension, which is the forms dimension, has four styles: *monarchic - hierarchic - oligarchic* – and *anarchic*. The third dimension is the levels dimension that has two styles: global and local. The fourth dimension is the scope dimension that has two styles: internal and external. The fifth dimension is the leanings dimension that has two styles: conservative and progressive.

Sternberg (1988: 92-94) developed a set of characteristics that distinguish methods of thinking:

- Cognitive methods are preferences in the use of capabilities, not capabilities themselves.
- The interconnectedness of methods and capabilities creates a greater factor that enables an individual to achieve goals better.
- Life tasks need to align thinking styles with abilities in order for individuals to be compatible and able to accomplish them.
- There is a profile of thinking styles that distinguishes the individual from others. The individual usually does not depend on a single thinking style, but rather on a set of cognitive methods.
- Cognitive methods vary across tasks and situations. Individuals have their preferred methods, but they may adopt other methods to adapt to the methods imposed on them.
- Individuals differ in the strength of their preferences for thinking styles.
- Individuals differ in their stylistic flexibility. Where some individuals can easily change their thinking methods so that they can meet the requirements of any particular situation or task, while others seem closed to a small set of methods, which reduces their ability to adapt to various tasks and multiple life situations.
- Strengthening social and environmental situations.
- Cognitive methods vary across time and place. Values of value at a particular time may be of no value at another time, and methods of value in a particular place may be of no value elsewhere.
- Cognitive methods are measurable.
- Cognitive methods can be taught. This prompted Zhang (2002a) to focus on teaching students' thinking methods so that students can use them to achieve a better achievement.
- Cognitive methods are generally neither good nor poor, but the value of the method varies with the extent to which it is appropriate for situations and tasks.
- Individuals tend to agree with others who agree with them in thinking styles, and realize that they are highly capable and vice versa, that is, individuals are evaluated based on the extent of symmetry or asymmetry between the methods of their thinking and those of their evaluators.

In general, styles of thinking are considered value-free, because the same way of thinking that a person can use it in a particular situation well, may hamper the same person in another position.

The Ministry of Education is greatly concerned with the topic of mathematics when it contributes to helping students in analytical thinking. When solving math problems, data are collected, parts are dismantled, and then relationships are linked to find a solution to them. The teacher makes a very big contribution to enrich the thinking style of his students. Yousef Methkal Abd Algani (2018; 2019a; 2019b), in his articles speaks about the impact of teacher on learning mathematics and its relationship with learning patterns and thinking styles and the fear of mathematics among students and about increasing their motivation to study mathematics. He pointed to the strong relationship between difficulties in mathematics and the thinking style, which leads to a fear of mathematics and math tests which he sees as a cycle: Ritual Learning \leftrightarrow Difficulties in Mathematics \leftrightarrow Math Anxiety \leftrightarrow Ritual Learning. He also pointed out the importance of the teacher's role in refining the students' personality through his thinking style.

This research article concerns the relationship between the thinking styles and self-esteem. The self-esteem of an individual clearly influences his determination of his goals, directions, and responses towards others and towards himself, which calls for emphasizing the importance of self-esteem in the lives of individuals. Self-esteem reflects an individual's ability to satisfy his psychological needs. In our contemporary society, people feel the need to have a positive conception of themselves, and that depends on their positive evaluation of themselves and the appreciation of others. Satisfying the need for self-esteem leads to the confidence of the individual in himself, his

sense of value of himself, and his personal compatibility. On the contrary, the inability of the individual to satisfy this need may lead to a sense of inferiority and weakness which leads to his feeling of frustration (Weber, Puskar, & Ren, 2010).

Researchers and scientists have provided many definitions of self-esteem that clarify its nature and its impact on the behavior of the individual and his interaction with the environment. Some of these definitions can be presented as follows:

Pryor (1994) emphasizes that an individual's judgment of himself is based on his experiences and feelings intertwined with his emotional responses, which results in the individual's self-evaluation, and affects his positive and negative relationships with others. Lawrence (1996:71) believes that self-esteem is "what an individual feels about the gap between his reality and what it should be. Barry, Grafeman, Adler, & Pickard (2007:44) define self-esteem as "a comprehensive assessment of oneself made by the individual himself.

From the above definitions, it may be said that self-esteem expresses the degree of congruence between the ideal self and the real self, as Lawrence (1996) have indicated, self-esteem also expresses the individual's attitude towards himself as he or she understands it, and reflects the individual's self-confidence through the individual's evaluation of himself and his good and bad qualities.

Many studies have revealed the existence of factors that distinguish individuals from non-innovators such as: self-realization, self-worth, self-assertion, self-sufficiency, autonomy, and the concept of self-esteem which called innovative factors, and this indicates that self-esteem is one of character traits that can be associated with certain ways of thinking can be acquired by the individual. Daniel David Martinez and Wagner Sternberg (2018) showed that, statistically, significant differences have been discovered between the genders in relation to what they prefer to do and the way they perceive themselves. Knowing this can help improve class planning, as it identifies strengths and weaknesses that may not have been discovered. According to the results of the study by (Keşan & Kaya, 2018) there were important relationships between self-esteem in mathematics and high levels of academic success as nearly 60% of academic success depended on high self-esteem. A study by Hareesol Khun (2017) concluded that self-esteem is one of the reasons that leads to the identification of methods of student's thinking.

A study by (Sellah, Jacinta & Helen, 2018) showed that students who have a high self-esteem have very high levels of cognitive styles. There is no doubt that identifying the ways of thinking of individuals and the predictive factors are important matters that help in developing their capabilities in a way that enables them to face the changes that affect their personalities and behaviors. This research aims to determine the contribution of the self-esteem in forecasting thinking styles in the function dimension among new mathematics teachers. Thinking styles express the individual's preferred methods of employing his capabilities. Individuals do not have only one type of thinking methods, but they have many of them. Individuals may have the same level of capabilities, but they differ in their thinking styles, which affects the performance of different tasks. Individuals may prefer to rely on certain thinking methods that are not appropriate for the tasks they perform, and then they fail to perform these tasks despite their capabilities to do so because their thinking methods do not correspond with their abilities. Hence it is important to guide individuals to the type of education or profession that is appropriate both to their thinking styles and to their capabilities.

Sternberg himself and many researchers have called for the need to pay attention to the variables that affect thinking styles, which helps to build programs to develop these methods. Among these variables is culture, whether it is at the level of the individual or group, gender, age, parenting attitudes, academic climate, and other variants.

In response to the calls of Sternberg and other researchers in the necessity of paying attention to studying the relationship between thinking methods and the variables affecting them, the researcher chose self-esteem as a variable to study the extent of predictability of some thinking methods through

them, and the percentage of their contribution to the prediction process. Individuals with high self-esteem consider themselves valuable and important, which helps them take advantage of the energies and potentials they have to the fullest extent possible. These individuals are characterized by their differentiation and the ability for independence from the group, the ability to adopt unconventional trends or methods in solving the problems facing them, and to make and implement their decisions and bear liability. Previous studies (within the limits of the available survey) confirmed the existence of a correlation between methods of thinking and self-esteem, and from these studies the study of Zhang (2002b), all of its results indicated that the methods that are characterized by innovation and cognitive complexity such as the method of legislative thinking and judicial thinking, are more closely related to individuals with high self-esteem.

The researcher's sense of the problem has crystallized from the following:

- 1) What is the contribution of the self-esteem in forecasting the legislative thinking style of the new mathematics teachers?
- 2) What is the contribution of the self-esteem in forecasting the executive thinking style of the new mathematics teachers?

The objective of the research is to determine the contribution of the Self-esteem, in forecasting thinking styles in function dimension among the new mathematics teachers in Israel.

The significance of this study: To determine the contribution of self-esteem in forecasting thinking styles and attracting the attention of educators and researchers when preparing training programs and researches that seeks to develop thinking styles. It is also important for building a curriculum; this must include directions as to how to develop thinking styles. Also the results of this research guide and direct decision-makers about the importance of the role of education colleges in the development of thinking styles. And the research hypotheses can therefore be defined as follows:

- 1) The contribution of self-esteem in forecasting the legislative thinking style of new mathematics teachers.
- 2) The contribution of self-esteem in forecasting the executive thinking style of new mathematics teachers.

2. METHOD

2.1. Methodology

The researcher used the quantitative approach which aims to examine the contribution of self-esteem in forecasting the legislative thinking style and the contribution of self-esteem in forecasting the executive thinking style of new mathematics teachers.

2.2. Population and Samples

The study sample consisted of (169) new mathematics teachers spread in 50 primary, middle and high schools from ministry of education in Israel (79 men, 90 women). The current study was limited to the mathematics teachers only for the following reasons:

- 1) There are some studies that have proven that students of mathematics had their own thinking styles that distinguish them from others.
- 2) Mathematics is a creative scientific discipline underlying deductive thinking processes.

2.3. The Instruments

The researcher used the Thinking Styles Inventory to measure the method of thinking, and used the Self-Esteem Scale to measure the self-esteem as follows:

2.3.1. Thinking Styles Inventory

This list was prepared by Sternberg and Grigorenko (1997) to measure thirteen methods of thinking, revealed by the theory of mental self-control presented by Sternberg (1997) or the theory of thinking styles. The list consists of 104 items that measure thirteen methods of thinking: legislative, executive, judicial, royal, minority, chaotic, hierarchical, macro, local, progressive, conservative,

internal, and external. Each item has a degree: the first alternative (which does not apply completely) is given the degree (1); the second alternative (which does not apply to a large degree) is given the degree (2); the third alternative (which does not apply to a small degree) is given the degree (3); the fourth alternative (I don't know) is given the degree (4); the fifth alternative (applies to a small degree) is given the degree (5); the sixth alternative (applies to a large degree) is given the degree (6); the seventh alternative (applies completely) is given the grade (7).

Each thinking style is measured by eight paragraphs randomly distributed within the list, and each thinking style is given its degree by adding the grades of its paragraphs in the answer sheet, thus becoming the lowest (8) and the largest (56) for each method.

Sternberg and Grigorenko (1997) calculated the alpha coefficient after applying the list to five different samples that were used in calculating the internal consistency of the sub-measures, and the stability coefficients ranged between 0.51 and 0.88. The bottom line is that the list of thinking styles is highly stable. Therefore, we find that the list of thinking styles is honest and stable.

2.3.2. Self-esteem scale

The measurement of self-esteem prepared by the researcher intended to discover/ reveal the opinion of the individual about himself and his work, which reflects the extent of the individual's confidence in himself, his ability to carry out the tasks entrusted to him, his ability to social interaction with others, and how satisfied he is. The self-esteem scale, consists of 113 items that fall into four main dimensions:

- Self-confidence: The individual's need to self-esteem in the various situations. This dimension consists of 28 items, 12 of which are positive (expressing the power of self-confidence), and 16 negative (expressing poor self-confidence).
- Personal competence: This dimension consists of 32 items, 13 of which are positive (expressing the power of feeling personal competence), and 19 negative (expressing weak feelings of personal competence).
- Relationship with others: This dimension consists of 32 items, 17 of which are positive (expressing good social interaction), and 15 negative (expressing poor social interaction).
- Feeling happy: This dimension consists of 21 items, of which 11 are positive items (expressing the individual's feeling of contentment and happiness), and 10 negative items (expressing the weakness of feeling dissatisfied).

The total number of items in the scale in its initial form was 113, of which 53 were positive items (expressing high self-esteem), and 60 negative items expressing (low self-esteem). The researcher calculated the stability of the scale as a whole (67 singles) using the Alpha Cronbach equation, and the value of the stability coefficient was 0.875 which is a high stability coefficient, Therefore, we find that the measure of self-esteem has the necessary validity and consistency for its use.

The Statistical Methods that the researcher uses are the correlation coefficients to calculate the internal consistency of the Thinking Styles Inventory, Alpha Cronbach coefficient and Factor analysis to verify the validity.

The *Research Variables* are classified into two types:

The independent variable is self-esteem

The dependent variable is some styles of thinking according to Sternberg's theory of thinking styles, the legislative, executive, and judicial thinking styles.

3. FINDINGS

The researcher can discuss and interpret the results of the hypotheses of the study, in light of the theoretical framework and previous studies. The following is a presentation of the results of the study's hypotheses and their interpretation.

The first hypothesis states: The contribution of self-esteem in forecasting the legislative thinking style of new mathematics teachers. The researcher estimated the coefficients of the multiple associations between the legislative thinking style and the school climate. The results were as in the following table:

Table 1. Multiple correlation coefficients and square correlation coefficients between the total degree of legislative thinking style and the Self-esteem variable

Independent variable	Coefficient of multiple correlation	of Multiple correlation coefficient squared	F	Connotation of F.
Self-esteem	0.454	0.191	3.912	0.050

From the previous table it is clear that the correlation coefficients between the legislative method and self-esteem were significant at (1.4%).

The second hypothesis states: The contribution of self-esteem in forecasting the executive thinking style of new mathematics teachers. The researcher evaluated the coefficients of the multiple associations between the executive thinking style and self-esteem. The results were as in the following table:

Table 2. Multiple correlation coefficients and the square correlation coefficients between executive thinking and independent variable in the study sample

Independent variable	Coefficient of multiple correlation	of Multiple correlation coefficient squared	F	Connotation of F.
Self-esteem	0.365	0.117	6.310	0.013

From the previous table, it is clear that the correlation coefficients between the executive thinking style and self-esteem was significant at (2.8%).

4. DISCUSSION AND CONCLUSION

One of the important factors in developing the professional identity of new teachers is their thinking style, which reflects their self-esteem and self-confidence. The teacher's identity is the result of his interaction with the proposed programs in colleges of education, which are supposed to contribute to developing his thinking style which will affect their students in the future. The research results showed the following:

First: The results of verification of the first hypothesis and its interpretation state that the contribution of self-esteem in forecasting the legislative thinking style of new mathematics teachers is upheld.

The result of the contribution of the self-esteem variable in predicting the legislative thinking style that encourages innovation, and the optimal use of capabilities can be explained by the fact that self-esteem increases the ability of individuals to use and employ their competence and capabilities, including their innovative capabilities in an optimal manner, which encourages the acquisition of the legislative thinking style.

This finding is consistent with the findings of Zhang (2001) in his research which found a correlation between legislative thinking with self-esteem. The researcher explains it that the creative methods are consistent with the characteristics of high self-esteem. Those with high self-esteem are characterized by being more connected and elevated in mutual social relationships and enjoying love

than others, and they want to do many things, they are flexible in adapting to social situations, and they are sensitive to the interests of others. Many of these characteristics intersect with the distinctive features of legislative thinking.

Second: The results of verification of the second hypothesis and its interpretation states that the contribution of self-esteem in forecasting the executive thinking style of new mathematics teachers is upheld. It can also be explained by the result of the contribution of the self-esteem variable in prediction negatively by the style of executive thinking that encourages dependency and submission and the preference for non-change. Individuals with low self-confidence believe that others work better than them, and that they accomplish what is assigned to them easily, and rely heavily on others to observe their actions. And these individuals are encouraged to acquire methods of thinking related to these characteristics that depend on the group, including: the executive style.

These results differ from the result of Twashemly Rasha (2008), which showed that there is no correlation between executive thinking style and self-esteem. It also differs with the findings of Bolkamedy Abbas (2012) that there is no correlation between executive thinking style and self-esteem. This is based on the premise that the thinking style of the teacher is related to the curriculum and to other teachers.

The researcher explains that the teacher's way of thinking would make him more restricted to the curriculum and the competency found in the educational books, which enhances his self-esteem in doing what is required of him to the fullest extent. Through the research conducted by the researcher on the new teachers, the direct impact between his thinking style and his self-esteem became clear. It is therefore important to work on programs in colleges of education that will develop the thinking style of their students because of the impact on society in the future. It is clear from the results of the analysis that:

- 1) The thinking style is an influencing factor in shaping the professional and personal identity of the new teacher.
- 2) The study showed the importance of research tasks and their impact on building the personality of the new teacher, and the teacher who adopts a specific teaching method and thinking style will ensure his success in the educational institution.

5. RECOMMENDATIONS

The current study examined the importance of the thinking style of new teachers, because of the importance and preference in building their personality and a strong community. The thinking style and self-esteem of the new teacher especially in the topic of mathematics reflects the competence of the teacher and thus will be reflected on the learning method of their students and prevent their difficulties and fear of mathematics.

In light of what was mentioned previously, the researcher suggested a number of recommendations:

- 1) It is important for colleges of education to build programs that improve and develop the thinking style of students of colleges of education.
- 2) Developing assignments and methods for evaluating students in colleges of education to develop their thinking levels.
- 3) The Ministry of Education is required to build completion courses for new teachers so that they are based on the foundations of their level of thinking.
- 4) More investment in new teachers by the Ministry of Education in order to integrate them faster into the educational system.
- 5) Conducting more research in self-esteem for students in the academies of education.

5.1. Suggested Researches

The researcher suggests conducting the following research:

- 1) Carrying out other studies aimed at studying the predictors of unused thinking styles in this study.

- 2) Conducting cross-cultural studies in thinking styles between Arab eastern and western societies.
- 3) Studying the relationship between thinking styles and other variables such as: emotional traits, self-efficacy, and intelligence.
- 4) Preparing study and educational programs to develop innovative thinking style.

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