Environment Learning as a Predictor of Mathematics Self - Efficacy and Math Achievement

Raed Zedan[1]

Jarmas Bitar[1]

Abstract

The conception of the personal capacity of the person by himself, and the ascription of success or failure, depend amongst others on external factors taking place in his close environment, as well as on internal factors depending on him himself. This study tries to explain the achievements in mathematics as an index for success, by environmental factors- class climate in a certain context- the subject of mathematics, as well as, by internal factors- mathematical self efficacy. And this with the goal of checking the connection between emotion expressed in the study environment in a class context in the mathematics lesson and its various dimensions (satisfaction and enjoyment, teacher- student relations, support, tension…), and cognition, expressed- in the present study, in mathematical self efficacy and achievements in mathematics. In the study 900 students of high schools in Israel participated, use was made of a classroom climate questionnaire in the mathematics lesson (Zedan, 2010), and a questionnaire of mathematical self efficacy (Nasser & Birenbaum, 2005). The findings pointed to strong positive correlation between the dimensions of class climate: satisfaction and enjoyment, the teacher's support, rules and instructions, competitiveness and between mathematical self efficacy and achievements in mathematics, and on weak negative- but significant correlations, between the indices of the classroom climate: lack of gender equality, tension and difficulty and between mathematical self efficacy and achievements in mathematics. The findings also pointed out that the dimensions of the class climate explain 50% of the variance in mathematical self efficacy, and explain 18% of the variance in achievements in mathematics. A strong positive correlation was also found, between mathematical self efficacy and achievements in mathematics, mathematical self efficacy explains 25% of the variance in achievements in mathematics. A very interesting finding in the current study is that mathematical self efficacy, which is considered as part of a cognitive theory, is explained to a very high extent, by the class climate prevailing in the mathematics lesson and its emotional, cognitive and behavioral dimensions, a finding supporting the approach seeing in cognition as part of emotion.

Keywords: Environment learning, Mathematics Self – efficacy, Math achievement, Motivation, Emotion and Cognition

Introduction

Theories of ascription (Weiner, 1984, 1986; Heider & Weiner, within Bar-El, 1996), support the fact that the reasons which the person ascribes to behaviors of other and of himself and especially to his successes and failures influence his motivation.

Every student looks for a reason for his successes and especially for his failures. The theories of ascription differentiate between internal and external causes. An internal cause is a cause connected to the personality of the person or to his behavior, for example a student failed in an examination in mathematics as he was not skilled in mathematics, or that he suffered from anxiety in examinations (Zeidner, 1998), or as he did not learn enough for the test. The source of an external cause lies outside the person, so that a student failed in a test in mathematics as the test was hard, or that the teacher was severe in his demands, or as the conditions of the test were unsuitable. To the same extent it is possible to ascribe the success of a student in a test to his self efficacy (Bandura, 1997), and to his abilities and the quality of his performance. As well as to his preparation or to the test/task conditions, to the context and environment which prevailed at the time of the test. When the conditions and demands placed before him determine his capacity to execute social and educational tasks.

[1] Academic College for Education in Israel.

Bandura's basic assumption, is that people have cognitive processes like memory, imagination, judgment, and accordingly, people can create mental representations of their environment- to remember past events, to analyze the present,. And to predict the future. Due to this, people can influence their environment. But the cognitive processes on which Bandura speaks come from a certain place- from development in a certain environment. That is, I can remember only what I was exposed to, children who are not exposed to many intellectual stimuli cannot remember them, and thus also the environment shapes the person through shaping his cognition. Bandura (1997) stated explicitly that people influence the environment and the environment influences them and this is a wheel repeating itself, when it is impossible to separate the individual from the environment. Also Melanie Klein (1946) noted that the person creates the environment and influences it thus, and also the reactions of the environment influence him. It is very important to examine processes for fostering the self direction in learning out of a certain social context (Marshall, 1989).

The class is an educational, study and social environment, students are found in the educational environment for a long time during long periods (Zedan, 2010), this environment can shape their personal, educational and social image (Fennema, 1985), when the environment by itself has characterizations and "personality" (Moos, 1976), the influence of the environment on the person acting in its framework, is connected with cognitive, emotional and social aspects (Slavin, 1990).

The self efficacy- which is the belief that it is in the person's capacity to influence positively the results of his action, is one of the cognitive concepts from the field of social learning (Bandura, 1997), which can be connected to the classroom climate prevailing in the educational environment. The classroom climate is found in interaction with phenomena which can contribute to the personal development of the student, influence his self image, his confidence, his positions towards the subject and his educational achievements (Cheng, 1999).

Similarly, a classroom climate, comprised amongst others of an interpersonal interaction which cane be characterized by encouragement or support or suppression and ignoring, a feeling of calming, motivation and serenity, satisfaction and enjoyment (Zedan, 2010), these conditions and feelings can increase or suppress the feeling of self efficacy (Lent, Brown & Hackett, 1999).

Many studies investigated the self efficacy and its connection with other concepts and traits in different varied fields (Lent, Brown & Larkin, 1986; Pintrich & Schunk, 2002; Randhawa, Beamer & Lundberg, 1993), but few studies were devoted to investigation of the issue in context of the educational classroom climate in a specific lesson (Zimmerman, 2000), by contrast with self efficacy which was investigated and discussed much in the context of a teaching- learning environment (Marshall, 1998). What was indeed found is the emphasis of the need to investigate in a combined fashion characteristics of social groups (Archer, 1996), in specific fields of content (Salomon, 1992; Zedan, 2011). And today much attention is devoted not only to personal variables but also to socio- conceptual- cultural variables found in the learner's environment.

These variables fill an important role in the development of motivation of the learner and in the creation of support conditions during the learning, when it is found that a positive correlation exists between self efficacy and persistence and motivation (Pintrich & Schunk, 2002).

Thus this study of mine seeks to test the correlation of self efficacy in mathematics as it is perceived by students, with their perception of the classroom climate prevailing in the mathematics lesson. Similarly the study seeks to compare between the power of production of self efficacy and the achievements in mathematics by contrast to the power of prediction of the classroom climate of the achievements in mathematics. This study of mine proposes a model for explanation of the achievements in mathematics in which the variable of self efficacy served as a mediating variable between classroom climate in the mathematics lesson and achievements in this subject.

Many studies pointed to the influence of background, positions, and motivation factors on success in studies and chiefly in mathematics (Schreiber, 2002), but a few studies dealt with the classroom climate in its present proposed structure, as predictor of cognitive factors which can explain success or failure in mathematics. It is worth noting that classroom climate is subject to change and reshaping, by pedagogic, didactic, and emotional intervention (Ilaiyan & Zedan, 2010).

Self Efficacy

The term self efficacy deals with beliefs of the individual as to his capacity to reach different levels of achievements in a certain task, and with the self assessment of a person as to his capacity to organize and to implement actions required for coping with the demands of the situation (Bandura, 1997).

Zimmerman (2000), defined self conception as self assessment of somebody of his capacities to organize or to execute series of actions in order to achieve a certain goal.

The concept appeared as part of a cognitive theory in the field of social learning. When self efficacy does not concentrate on abilities alone, but on assessment of the gap, of it exists, between the belief in abilities and the demands of reality, which is the belief as to the capacity to execute effectively the behaviors demanded in order to produce the result.

In Bandura's claim a feeling of self efficacy is determined dealing with a specific situation, a specific task and is not a global personal trait. And thus this feeling depends on varying levels of external demands, dictating various behaviors. Self efficacy is perceived in two contexts: in the context of a specific task or a certain subject, and in the context of a generalized general trait, defined as: "Assessment of an individual of a general capacity to execute successfully a wide variety of situations challenging achievements" (Eden, 1988).

In the research literature a distinction exists between generalized self efficacy which is defined also as self-concept (Pajares & Schunk, 2001), which is general perception of the capacity of the learner in a subject or a certain field, like mathematics, languages or sport, and specific self efficacy, which is the perception of the capacity in a specific task within a certain subject (for example, the perception of the capacity to solve equations with one unknown in mathematics (Bandura, 1997; Randhava & Gupta, 2000; Zimmerman, 2000).

Classroom Climate

The concept "classroom climate" is a synonym for classroom environment, and it deals with the processes created as a result of mutual activity taking place in the educational environment, which is the classroom. This concept deals with the personal, social, educational and cultural characteristics of the students found in that educational environment, and with the way in which they perceive the events in it, as a result of the interaction between the students and themselves and between the teacher and his students, as well as between the profession and the studied subject (Schmuck & Schmuck, 1974). It was found that, the classroom climate is connected to the social field, to the emotional field and to the educational field together, and influences educational achievements, interest in studies and willingness to continue to learn in class (Slavin, 1983). Classroom climate, is created, amongst others, through a social interaction based on expectations, norms and routines (Toseland, Jones & Gellis, 2004).

Educational and social events and interactions take place in the classroom, which are ascribed an influence on the quality of learning; and on the educational product, both in the personal norms (self concept, personal load, satisfaction etc.), and also at the group level (the feeling of belonging, interpersonal relations, coherence etc.) (Gal-Or, 1988).

Pazi (1997) defines the classroom climate as a totality of environmental factors- norms, positions, execution of tasks, democracies, help, cooperation, interpersonal expectations, coherence, patterns of communications - influencing the exclusive character of the interaction in class and the patterns of behavior. Following the activity of dynamic social processes, the trend is reinforced seeing in the class as a social organization acting in small subgroups. The learning groups in class are perceived as task-oriented- educational and dynamic social groups, operating whilst stressing the educational- social climate, which helps social- emotional and cognitive- theoretical care (Walberg & Anderson, 1968).

Sharan et al. (1985) deal with two central aspects in the classroom climate, the study aspect, focusing on the positions, expectations and beliefs of the teachers and students in the process of teaching, achievements and assessment; and the social aspect, connected to the quality of relations between the teacher and his students and the students and themselves, and to their connection one to another, as well as to behavioral expectations and patterns of communication.

Two central assumptions exist in the classroom climate research: the one states that differences exist in the classroom climate and in its factors, and thus it is possible to investigate systematically the factors influencing its creation; the second assumption supports the fact that the classroom climate is found in interaction with phenomena which can contribute to the personal development of the student, influence his self image, his confidence, his positions towards the subject and his educational achievements (Cheng, 1999).

Class Climate and Self Efficacy

Studies showed that a positive climate raises the self assessment of the students and advances their educational performance (Fraser, McRobbie & Giddings, 1993). Classes whose climate is of competitiveness, hostility and alienation, cause anxiety and discomfort and do not enable the educational development of many of the students. Classes in which mutual support exists between the students and themselves and between the students and the teacher, enable development of self assessment, provide security, calm, foster personal responsibility, willingness to involvement and a feeling of belonging (Lewis, Schaps & Watson, 1996). A warm, supportive and positive classroom climate brings satisfaction and pleasure positive interpersonal relations and low competitiveness and reduces the level of tension between the students (Zedan, 2010).

A significant influence is found of the classroom climate on the positions of students towards various subjects, so that the climate factors are found in significant positive correlation with positive positions towards the subject (Haladyna, Shaughnessy & Shaughnessy, 1983).

Fraser & Tobin (1991) agree, that the classroom climate influences the behavior of the student and his level of knowledge, his educational achievements, the motivation, his self image, his positions towards the subject, towards the class and the school, towards teaching and education in general. Thus research of the factors influencing the classroom climate enable to identify and understand social process acting in class, and to explain the behavior of students on the cognitive and emotional plane.

In Bandura's claim (Bandura, 1997) there exist sources which contribute to the shaping of self efficacy: experience and previous execution achievements, observation of others and learning from an existing model, social encouragement and support and positive physiological reactions at the time of execution, like emotional arousal. Hence, the physiological, emotional and cognitive situation of a person at the time of execution of the task contributes to shaping his perception of self efficacy. For example, signs of anxiety, fatigue or depression at the time of execution can lower the feeling of self efficacy, whilst a feeling of calming, motivation and serenity can increase the feeling of self efficacy (Lent, Brown & Hackett, 1999). Part of the sources contributing to self efficacy are important components to the class climate (encouragement and support by colleagues and teacher expressed in the quality of the student- student, and teacher-student, connection and other components (Zedan, 2010). Zimmerman (2000) stresses that self efficacy is sensitive to the context in which the task is performed. Hence it is possible to conjecture that a class atmosphere can predict self efficacy.

Classroom Climate, Self Efficacy and Achievements in Mathematics

It was corroborated by researchers that self efficacy predicts achievements of the students in mathematics (Koutsoulis & Campbell, 2001; Pajares & Graham, 1999), Pajares & Kranzler, 1995) proposed a path model for explanation of the achievements in mathematics which included within it self efficacy in mathematics, general mental capacity, mathematics anxiety, self efficacy concerning self regulation, achievements in mathematics and gender. From an analysis of the findings it was reported on a direct influence of self efficacy on achievements, whose power was found as identical to the power of the influence of a general mental capacity on achievements. The research literature reports on Pearson correlations between self efficacy and academic execution ranging in a range $0.49< r <0.70$, and on the path coefficients expressing the direct influence of self efficacy on achievements, motivation in a range of $0.35\leq B \leq 0.55$ (Pajares, 2002). Also Nasser & Birenbaum (2005) found that self efficacy is a strong predictor for educational achievements by comparison to mathematics anxiety and positions towards mathematics.

In a study which was executed among junior school students (Zedan, 2011), it found that a significant positive correlation exists between the classroom climate with its various dimensions (satisfaction and enjoyment, teacher-student relations, student- student relations) and the level of achievements in mathematics, and he found a negative correlation between competitiveness dimension and tension and gender inequality and educational achievements.

It was also found that the method of teaching has an influence which determines significantly the character of the environment prevailing during the lesson on the classroom climate (Ilaiyn & Zedan, 2010), and that the personal and cultural characteristics of the learner have an influence on the conception of classroom climate with him (Zedan, 2011). Further studies (Menis, 1996; Raviv & Reised, 1990) testify to significant positive correlations between classroom climate and educational achievements.

Self efficacy lets the student feel more secure and less anxious (Butler & Winne, 1995), and it can influence strongly the student's capacity to cope with anxiety, to cope with a hostile educational environment, to present educational goals, and to use analytic thinking. Bandura (1993, 1997) found that a correlation exists between high self efficacy and a profound approach to learning (Papinczak, Young, Groves & Haynes, 2008), it is very important for the classroom climate to be encouraging, supportive and warm, in order for student to be able to learn from their errors and not to be ashamed of making mistakes and asking. The classroom climate contributes to the increase of the interest and the motivation in learning and to the improvement of achievements (Broussard & Garrison, 2004).

And it is possible to conjecture that a classroom climate in the mathematics lesson is a strong predictor for educational achievements in mathematics more than mathematical self efficacy.

Method

Participants

900 7^{th} until 11^{th} grade students participated in the study from ten Arab schools in Israel, 258 7^{th} grade (28.7%), 241 8^{th} grade (26.8%), 286 9^{th} grade 31.8%) and 115 high school students (12.7%). 398 boy students (44.2%) and 460 girls students (51.1%).

Instruments

Mathematical achievement: The achievements in mathematics were taken from the list of marks of the class educators and/ or from the school secretariat. One needs to note that in the questionnaire which was handed out to students, they were asked to report on their achievements in mathematics, but this only with the goal of completing the picture before the students whilst filling the questionnaire, but the reference in the data analysis as to achievements which were received from the class educators and/ or from the secretariat of the school. It is important also to note that the correlation was calculated between the mark reported by the students and their true mark and it was found that the value of the correlation coefficient of Pearson between them was equal to 0.85.

Classroom climate in the mathematics lesson: in this study use was made of a classroom climate questionnaire in the mathematics lesson (Zedan, 2010), the questionnaire was matched to the high school students, amongst others the scale of answers of the questionnaire was extended from three grades to five grades of a Lickert scale, a factor analysis yielded eight factors. table 1 in the appendix presents the factors and the items comprising them.

Self efficacy questionnaire: a structured questionnaire composed of eleven items for measurement of specific mathematical efficacy, the questionnaire was built by Nasser and Birenbaum (2005), on the basis of the questionnaire of Jerusalem and Schwarzer (1992). Examples of statements: I can solve exercises in algebra with various methods, I can translate a verbal problem into an algebraic formula, when I encounter a hard mathematical problem I do not despair and I continue to look for a solution. The scale of answers ranges from grade 1 (do not agree at all) until grade 5 (agree totally). An exploratory factor analysis yielded one factor, and this matches the one dimensional structure of the original questionnaire, which was found at a level of reliability according to the Cronbach alpha coefficient of 0.902, by contrast to 0.84 in a study of Nasser and Birenbaum (2005). This finding supports findings of other researchers (Koutsoulis & Campbell, 2001; Pajares & Graham, 1999).

Findings

In order to test the correlationtion between the indices of the classroom climate in the mathematics lesson as they are perceived by high school students and mathematical self efficacy and achievements in mathematics, a correlation test was executed, by Pearson's correlation coefficient. table 2 in the appendix presents the Pearson correlation coefficients between classroom climate dimensions, math self efficacy and math achievement. It was found that:

- A significant strong positive correlation between the dimension of Satisfaction and enjoyment in the mathematics lesson and mathematical self efficacy (r=0.643, p<0.001), similarly a strong positive connection was found between this dimension and educational achievements in mathematics (r=0.399, p< 0.001), this means that the more the student enjoys in the mathematics lesson and feels satisfaction and contentment the higher will be his math self efficacy, and the higher will be his math achievements.
- A significant strong positive correlation between the dimension of teacher support and math self efficacy (r=0.537, p<0.001), similarly an intermediate positive correlation is found between this variable and educational achievements in mathematics (r=0.285, p<0.001), this means that the more supportive a teacher is of student, the more he encourages and demonstrates concern towards him and towards his progress and achievements the higher the student's math self efficacy will be, and the higher his math achievements will be.
- A significant strong positive correlation between the dimension of rules and instructions and math self efficacy (r=0.617, p<0.001), similarly an intermediate positive correlation was found between this dimension and educational achievements in mathematics (r-0.327, p<0.00), this means that clearer are the rules and instructions in class in the mathematics lesson and the more the teacher insists on them and clarifies them and the more the student obeys these rules and instructions the higher will be the math self efficacy of the student, and the higher will be his math achievements.
- A significant weak negative correlation between the dimension of inequality and math self efficacy (r=-0.138, p<0.01), similarly a weak negative correlation as found between this dimension and math achievements in mathematics (r=-0.162, p<0.01), this means that the more inequality exists in the attitude of the teacher to the students in the mathematics lesson and there exists discrimination on a gender background, the math self efficacy of the student will be lower, and his achievements in mathematics will be lower.
- A significant weak negative correlation between the dimension of tension and math self efficacy (r=-.090, p<0.05), similarly a weak negative correlation was found between this dimension and educational achievements in mathematics (r=-0.115, p<0.01), this means that the more tension exists in the mathematics lesson and in relations between students in the mathematics lesson, the math self efficacy of the student will be lower, and his achievements in mathematics will decline.
- A significant intermediate positive correlation between the dimension of competitiveness and math self efficacy (r=0.405, p<0.001), similarly there exists a positive under intermediate correlation between this dimension and the educational achievements in mathematics (r=0.206, p<0.001), this means that the more competitiveness exists between the student sin the mathematics lesson the higher will be their math self efficacy, and the math achievements will rise.
- A significant intermediate negative correlation between the dimension of difficulty and math self efficacy (r=-0.296, p<0.001), similarly an intermediate negative difficulty was found between this dimension and achievements in mathematics (r=-.0.262, p<0.001), this means that the harder are the educational tasks and missions and the material in mathematics the math self efficacy of the students, and their math achievements will decline.
- A significant strong positive difficulty betweens math self efficacy and educational achievements in mathematics (r=0.504, p<0.001), this means that the higher the math self efficacy the higher will be the achievements in mathematics.

A linear regression analysis was executed when in the first stage the dimensions of mathematic classroom climate were introduced as variables predicting the math self efficacy, in the second stage the variable of achievements in mathematics was introduced as a predicted variable, and in the last stage an analysis for prediction of math achievements according to math self efficacy was executed.

The regression analysis points out that the dimensions of class climate in the mathematics lesson succeed in predicting the self efficacy in mathematics (F=107.76, p<.000). and explain 50% of the variance in it. The class climate dimensions which succeeded in predicting clearly the mathematical self efficacy are: pleasure, satisfaction and contentment, rules and instructions, inequality, tension, unsuitable behavior and discomfort, competitiveness and difficulty. When the main predictor is the dimension of pleasure, satisfaction and contentment (β=0.360, p<.001), afterwards the dimension of rules and instructions (β=0.284, p<.001), after it the dimension of unsuitable behavior and discomfort (β=0.147, p<.001), afterwards the dimension of difficulty (β=-0.122, p<.001), and after it the dimension of gender inequality (β=0.082, p<.05), and afterwards the dimension of competitiveness (β=0.078, p<.05), and finally the dimension of tension (β=-0.071, p<.05).

Similarly it was found that the dimensions of class climate in the mathematics lesson succeed in predict achievements in mathematics (F=22.75, p<.000), and explain 18% of the variance in them. It was found that the dimension of pleasure, satisfaction and contentment predicts the achievements in mathematics (β=0.301, p<.001), also the dimension of difficulty is found as a predictor for achievements in mathematics (β=-0.127, p<.001), and finally it was found that the dimension of clear rules and instructions predicts achievements in mathematics (β=0.103, p<0.05).

The regression analysis pointed out that mathematical self efficacy succeeds in predicting achievements in mathematics (F=293.22, p<.000, β=0.504, p<.001), and that it succeeds in explaining 25.4% of the variance in them.

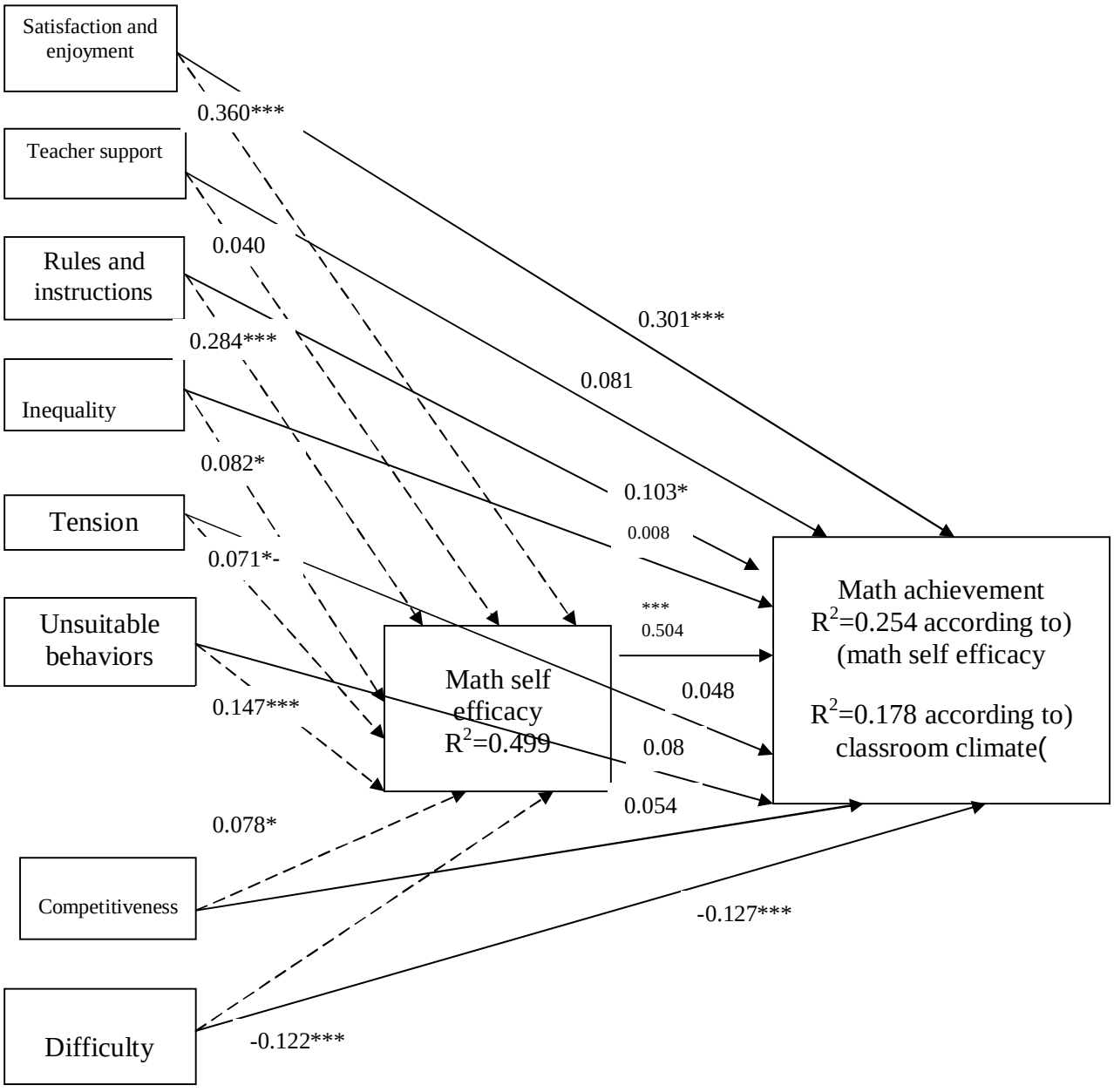

Illustration 1: Research Model Explaining the Academic Achievements in Mathematics Based on Classroom Climate Dimensions in Math Class and Mathematical Self-Efficacy

Discussion

Classroom climate and mathematical self efficacy: The findings pointed to strong positive correlations between the dimensions of classroom climate: satisfaction and enjoyment, support of the teacher, clear rules and instructions and competitiveness and between mathematical self efficacy, and on weak- but significant negative correlations, between the dimensions of classroom climate: gender inequality, tension and difficulty and between mathematical self efficacy. The findings also pointed out that the dimensions of classroom climate explain 50% of the variance in mathematical self efficacy.

Zimmerman found that self efficacy is influenced by the context in which the student executes the tasks (Zimmerman, 2000). A context which it is possible to refer to as a learning environment or study atmosphere or as it is possible to call it also a class climate. Also (Bandura, 2006; Schunk & Pajares, 2002), found that self efficacy is influence by the educational environment. The teacher has an important and decisive part in shaping the learning environment (Lambert & McCombs, 1998). A teacher can teach any subject in mathematics in a simpler, prettier and more interesting form, refrain from entangling what there is no need to entangle and refrain from giving "vague" exercises which have no importance in the continuation (and there is an abundance like those in the study "books") (Zedan, 2005).

However, let us not forget that there are two sides to the coin. The student needs to be prepared to gird loins and to make an effort, as mathematics is not easy. Hence if the student sees a challenge in it, displays interest in it and is prepared to invest, the job of the teacher is to help him to advance and even to enjoy. There is no contradiction between hard work and pleasure. But if the student has no interest in mathematics, from any reason, there is no point for us to force it.

The teacher must exercise humor, maximize the capacity of the student, encourage him to think creatively and in a non- routine fashion and show them that it is possible to work hard but to enjoy. The teacher will teach mathematics, didactics, psychology, and any other subject incessantly, which can improve his knowledge and his work methods, and simultaneously will develop cognitive empathy and emotional intelligence towards his students. Analysis and understanding of all these components can bring a better understanding of the teacher-student relationship and of the teaching material in the process of teaching and learning of mathematics (Menis, 1999).

It was still found, that teachers supplying tasks of thinking challenges, and presenting problems seeking asking questions, foster a positive atmosphere in their classes (Dolezal, Walsh, Pressley, & Vincent, 2003); and that a combination of shaping and fostering positive behavior and a supportive and warm interpersonal approach bring good performance of the students and characterizes the qualitative class with a positive environment (National Institute of the Child, 2005).

The teacher is perceived as guiding and assisting in learning, he needs to enrich and vary in the educational activities, he needs to encourage, support and establish the learning on culture of thinking and reasoning, he is required to promote team work and cooperativeness to dispel and reduce tensions in class, and to strengthen the internal motivation among his students (Zilberstein, 2001).

The woman researcher Marshall (Marshall, 1998), noted the characteristics of the environment fostering self direction in learning, she noted the characteristics: acceptance of the difference, respect between the colleagues, developed of student-teacher relations promoting significant learning and based on mutual respect, she claims that these interactions can support qualitative communications imparting support, warmth, calm, social interaction of cooperation, as the important characteristics to foster a learner with self direction.

When the concept of self direction deals with the capacity of learners to instigate thoughts, emotions and actions which will bring promotion of their motivation and learning in a process of systematic coordination and adaptation of thoughts, of emotions and of these actions (Zimmerman, 2000). The same "self efficacy" in all the components of functioning of the individual: on the cognitive, the meta cognitive, the emotional, the social and the behavioral plane, influences learning in which the individual is capable of developing responsibility for learning (Emmanuel, 2003).

Development of conditions in the educational environment has importance, in which a space of action will be given to students, and in which difficulties and obstacles will serve as a winch for development and growth (Butler & Winner, 1995).

Marshall believes in the power of the positive climate in fostering a learner with self direction (Marshall, 1998). By contrast to this a student who feels tension, anxiety or depression and stress will not concentrate on the lesson and will not execute the educational tasks as it is necessary (Emmanuel, 2003), the students are demanded more and more to collaborate with their colleagues, to contribute their exclusive part to the group product. The findings of the current study supported the fact that self direction functions in learning develop with greater vigor in supportive social conditions. No matter how intensive the attention, how deep the preservation in the memory, and how exact the action, learning cannot take place without reinforcements. If we have not interest, we do not make the effort. This is an influence of the behavioral approach on Bandura's theory (that is here he is a behaviorist).

But- according to the cognitive influence, Bandura proposes that the reinforcements do not have to be direct, and that this is the function of the teacher. It was further found that, students who insist on hearing feedback and assessment of performance, will have higher achievements and will have high self efficacy (Andrade, 2010; Stiggins, 2005).

Part of the classroom climate dimensions, it is possible to scribe to the emotional aspect in the process of learning, like, pleasure contentment and satisfaction, the teacher's support, and the dimension of tension. Another part of the class climate dimensions, it is possible to scribe to the cognitive facet in the process of learning, like difficulty and competitiveness. And part it is possible to ascribe to the behavioral facet like: insistence on clear rules and instructions, unsuitable behavior in class.

The findings of the current study pointed out that "emotional" dimensions succeed in predicting and explaining the self efficacy which is considered as part of a cognitive theory, these findings support the findings of (Meyer & Turner, 2006), who pointed out that the occupation of students with learning, requires a positive emotional experience, which contributes to the classroom climate which creates the basis for student- teacher relations, an interaction which is necessary to develop and foster motivation for learning. It was further found that, the dimension of difficulty, which belongs to the cognitive facet, is connected to mathematical self efficacy, this finding supports the finding of Zimmerman who pointed out that, the level of self efficacy depends on the level of difficulty of a certain task (Zimmerman, 2000). The level of difficulty depends on the character of the subject of mathematics (Fischbein, 1993), but depends more on the capacities and abilities of the teacher and on his teaching strategies, so that a teacher could teach any subject in mathematics in a simpler, prettier and more interesting form, to refrain from entangling what there is no need to entangle and to avoid giving especially hard exercises (Zedan, 2005).

The findings of the study point to a connection between the dimension of competitiveness and mathematical self efficacy, this finding support the claim of Bandura that beliefs in capacity guide the search for challenges (Bandura, 2006). When students excel, with a high self efficacy, they cope with more challenging tasks, and always are found in an advanced stage from the point of view of quality and quantity of exercises with which they cope, by comparison to their colleagues in the class.

Generally, it was found that mathematical self efficacy which is considered as part of a cognitive theory, is influenced and explained by the class climate prevailing in the mathematics lesson and its emotional, cognitive and behavioral dimensions.

Climate and achievements: The findings also pointed to positive correlations between the dimensions of the classroom climate: satisfaction and enjoyment, support of the teacher, clear rules and instructions, competitiveness and between achievements in mathematics, and weak but significant negative correlations, between the dimensions of the classroom climate gender inequality, tension, and difficulty and between achievements in mathematics. The findings pointed out that the dimensions of the class climate explain 17.8% of the variance in achievements in mathematics. This finding supports many studies which found that the classroom climate contributes to the increase of interest and motivation in learning and improves the achievements (Broussard & Garrison, 2004). Also (Slavin, 1983) found that the classroom climate is connected to the social field, to the emotional field and to the educational field together, influences the educational achievements, the interest in studies and willingness to continue to learn in class. In a study he executed among junior school students (Zedan, 2011), it found that there exists a significant positive correlation between the class climate in the mathematics lesson and the level of achievements in mathematics.

Mathematical self Efficacy and achievements in math: A strong positive correlation was found between mathematical self efficacy and achievements in mathematics, mathematical self efficacy explains 25.4% of the variance in achievements in mathematics. The finding is not surprising, it only reinforces many findings in the field. Eccles and Wigfield (2002), found that academic self efficacy is a very strong predictor of educational achievements. And a further reinforcement was already found in the study of Pajares and Kranzler (1995), which presented a direct affect for self efficacy on performance in mathematics. Most of the researchers in the field claim that the efforts of a student for self regulation in learning require the organization of time, self discipline and effort. Schunk (1991), found that the beliefs of self efficacy among students influences behaviors directed to the achievement of achievements like: choice of task, persistence, the amount of effort and the acquisition of abilities.

By comparison to students who cast doubt on their educational capacities, students who feel effective in learning or in the execution of tasks, work harder, persist along time when they encounter difficulties and reach high achievements.

The difference between the percentage of variance in educational achievements explained by the classroom climate (17.8%), and the percentage of variance in math achievements explained by mathematical self efficacy (25.4%), demands giving an explanation. Classes of Arab students are characterized by high consolidation and coherence, positive student- student relations, and are not especially competitive (Zedan, 2010), competitiveness usually directed to ambitiousness. But in the current study it was found that students are characterized by a higher level of mathematical self efficacy than the dimensions of class climate. Additionally the class climate is a complex concept and includes within it emotional, cognitive and behavioral and/ or social dimensions, but mathematical efficacy is a cognitive concept as well as achievements in mathematics.

Summary

When theoreticians connect between emotion, cognition and motivation, the processes are located usually either in a hierarchic or chronological relationship one to another (Meyer & Turner, 2009). Lazarus (1991) proposed that the solution to connect between emotion and cognition is the recognition that emotion is a super- concept containing cognition. In order to explain the theory of motivation, Ford (1992), claims that emotions are an integral part of the system of motivation. It seems acceptable among the theoreticians and researchers to highlight the mutual dependence between motivation, emotion and cognition- and the theoretical starting point is that they are usually connected one to another (Meyer & Turner, 2009). An additional approach to the combination of emotion, motivation and learning needs to be with the goal of building new models or theories, which can be implemented in class situations, like also in extra- class situations. New theories can explain the interaction between emotion, cognition and motivation in order to predict effective learning in a certain context (Meyer & Turner, 2009). A very interesting finding in the current study is that mathematical self efficacy, which is considered as part of a cognitive theory, is explained to a very high extent, by the class climate prevailing in the mathematics lesson and its emotional, cognitive and behavioral dimensions, a finding supporting the approach seeing in cognition as part of emotion.

A discussion of self efficacy needs to be in the content of the educational environment and the climate prevailing in it. And when they seek to foster a learner with high self efficacy it is important previously to foster the class climate, one needs to improve the interpersonal relations and to reduce the level of tension in class, it is also important to satisfy conditions which would enable pleasure, similarly the support of the teacher of his students is very important, in addition to clarification of the rules and formality as an important dimension which one needs to assure in the mathematics lesson. The teachers must consider the traits of mathematics as an abstract and hard field of knowledge, and they need to adopt strategies in order to help students to cope with the educational material and the mathematical tasks, all this can increase the self efficacy with the students and as a result of it it is possible then to observe it in educational achievements. These variables fill an important job in the development of the learner and in the creation of support conditions during the learning. When it is found a positive connection exists between self efficacy and persistence and motivation (Pintrich & Schunk, 2002).

References

Andrade, H. L. (2010). Students as the definitive source of formative assessment: Academic self-assessment and the self-regulation of learning. In G. J. Cizek and H. L. Andrade (Eds.), Handbook of formative assessment (pp. 90-105). New York, Routledge.

Archer, J. (1996). Comparing women and men: What is being compared and why?. American Psychologist, 51(2), 153 – 154.

Bandura, A. (1986). Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. Educational Psychologist, 28, 117-148.

Bandura, A. (1997). Self-efficacy: The exercise of control. New York: W H Freeman/Times Books/Henry Holt and Co.

Bandura, A. (2000). Exercise of human agency through collective efficacy. Current Directions in Psychological Science, 9(3), 75–78.

Bandura, A. (2006). Toward a psychology of human agency. Perspectives on Psychological Science, 1(2), 164–180.

Bar- El, Z. (1996). Educational psychology, Even Yehuda: Reches Publications. 181-204. [Hebrew]

Broussard, S.C., Garrison, M. E. (2004). The relationship between classroom motivation and academic achievement in elementary school-aged children. Family Consumer Science Research Journal, 33(2), 106-120.

Bronfenbrenner, U. (1979). The ecology of human development: Experiments by nature and design. Cambridge, MA: Harvard University Press.

Butler, D., Winne, P. (1995). Feedback and self-regulated learning: a theoretical synthesis. Review of Educational Research, 65(3), 245-81.

Cheng S. T. (1999). Perception of classroom environment in Hong Kong: differences between students in junior and senior forms, Adolescence, 34(136), 793 – 798.

Dolezal, S. E., Walsh, L. M., Pressley, M., Vincent, M. M. (2003). How nine third-grade teachers motivate student academic engagement. Elementary School Journal, 103(3), 239- 269.

Eccles, S.J., & Wigfield, A. (2002). Motivational beliefs, values, and goals. Annual Review of Psychology, 53(1), 109 – 132.

Eden, D. (1988). Creating expectation effects in OD: Applying self-fulfilling prophecy. Research in Organizational Change and Development, 2, 235–267.

Emmanuel, D. (2003). Fostering of the learner with self direction: pedagogy of case literature. Mofet Institute and the Ministry of Education Central District. [Hebrew]

Fennema, E. (Ed.) (1985). Explaining sex-related differences in mathematics: Theoretical models. Educational Studies in Mathematics, 16, 303 – 312.

Fischbein, E. (1993). The interaction between the formal, the algorithmic and the intuitive components in a mathematical activity, In R. Biehler, R. W. Scholz, R. Strasser & B. Winkelmann (Eds.) Didactics of Mathematics and Scientific Discipline, 231-145. Netherlands. Dordrecht: Kluwer.

Ford, M. E. (1992). Motivating humans: Goals, emotions, and personal agency beliefs. Newbury Park, California: Sage.

Fraser, B.J., McRobbie, C.J., Giddings, G.J. (1993). Development and cross-national validation of a laboratory classroom environment instrument for senior high school science. Science Education, 77, 1-24.

Fraser, B.J., Tobin, K. (1991). Combining qualitative methods in classroom environment research, In: B.J. Fraser and H.J. Walberg (Eds.). Educational Environment, evaluation, Antecedents and Consequences, 271-292, Oxford: Pergamon Press.

Gal Or, I. (1988). Class climate, within: Sh. Zadkiyahu (editor), Class climate, essence and act, (19-24), Jerusalem: the Ministry of Education and Culture. [Hebrew]

Haladyna, T., Shaughnessy, J. and Shaughnessy, J.M. (1983) A causal analysis of attitude toward mathematics. Journal of research in mathematics education, 14(1), 19-29.

Ilaiyan, S., Zedan, R, (2010). Classroom Climate and Teaching Methods in mathematics Classes. Journal of Science Education.11(1), 88 – 91.

Jerusalem, M., & Schwarzer, R. (1992). Self-efficacy as a resource factor in stress appraisal processes. In R. Schwarzer (Ed.), Self-efficacy: Thought control of action (pp. 195 – 213).Washington, DC: Hemisphere.

Klein M., (1946). Notes on some schizoid mechanisms. In: Development in Psychoanalysis. Ed M. Klein, London, Hogarth Press.

Koutsoulis, K.M., & Campbell, R.J. (2001). Family processes affect student motivation and science and math achievement in Cypriot high schools. Structural Equation Modeling, 8(1), 108 – 127.

Lambert, N.M., McCombs, B. L. (eds.)(1998). How Students Learn: Reforming Schools Through Learner-Centered Education, Washingtio DC: American psychological association.

Lazarus, R. S. (1991). Cognition and motivation in emotion. American Psychologist, 46, 352–356.

Lent, R. W., Brown, S. D. & Hackett, G. (1999). A social cognitive view of school-to-work transition. The Career Development Quarterly, 48, 297-304.

Lent, R. W., Brown, S. D., & Larkin K. C. (1986). Selfefficacy in the prediction of academic performance and perceived career options. Journal of Counseling Psychology, 33(3), 265-269.

Lewis, C., Schaps, E., Watson, M. (1996). The caring classroom's academic edge. Educational Leadership, 54(1), 15-21.

Marshall, S. (1989). Affect in schema knowledge: Source and impact. In D.B. McLeod & V.M. Adams (Eds.), Affect and mathematical problem solving: A new perspective (pp. 49-58). New York: Springer - Verlag.

Menis, I. (1996). Evaluation and improvement of class climate in the junior school in Israel in the subject of mathematics. From theory to practice in planning studies, 1, 112-126. [Hebrew]

Menis, I. (1999). The influence of teaching methods in mathematics on the educational achievements in the junior school. Within: Globman, R. and Iram, I. (eds.), The development of teaching in education institutions in Israel, Tel- Aviv: Ramot. [Hebrew]

Meyer, D. K. & Turner, J. C.(2009). Re-conceptualizing Emotion and Motivation to Learn in Classroom Contexts. Educational Psychology Review, 18, 377–390.

Moos, R.H. (1976). Evaluating and changing community settings. American Journal of Community Psychology, 4, 313-326.

Nasser, F. & Birenbaum, M. (2005). Modeling Mathematics Achievement of Jewish and Arab Eighth Graders in Israel: The Effects of Learner-Related Variables. Educational Research and Evaluation, 11, 3, 277— 302.

National Institute of Child Health and Human Development Early Child Care, Research Network (2005). A day in third grade: a large-scale study of classroom quality and teacher and student behavior, The Elementary School Journal, 105 (3), 305 – 323.

Pajares (2002). Overview of social cognitive theory and of self-efficacy. Retreived from http://www.emory.edu/EDUCATION/mfp/eff.html

Pajares, F., & Graham, L. (1999). Self-efficacy, motivation constructs, and mathematics performance of entering middle school students. Contemporary Educational Psychology, 24(2), 124 – 139.

Pajares, F., & Kranzler, J. (1995). Self-efficacy beliefs and general mental ability in mathematical problemsolving. Contemporary Educational Psychology, 20, 426–443.

Pajares, F., & Schunk, D. H. (2001). Self-beliefs and school success: Self- efficacy, self-concept, and school achievement. In R. Riding & S. Rayner (Eds.), Self-perception (pp. 239-266). London: Ablex Publishing.

Pazi Israel, (editor) (1997). Communications and social climate in class, Haifa University, Oranim the Academic Division, the Department for Education. [Hebrew]

Pintrich, P. R., & Schunk, D.H. (2002) Motivation in education. Theory, research, and application. (2nd, ed.). New Jersey: Merrill Prentice Hall.

Randhawa, B., Beamer, J., & Lundberg, I., (1993). Role of mathematics self-efficacy in the structural model of mathematics achievement. Journal of Educational Psychology, 85(1), 41-48.

Randhawa, B. S. & Gupta, A. (2000). Cross-national gender differences in mathematics achievement, attitude, and self-efficacy within a common intrinsic structure. Canadian Journal of School Psychology, 15(2), 51–66.

Raviv, A., Reised, E. (1990). Teachers and students: two different perspectives: Measuring social climate in the classroom. American Educational Research Journal, 27 (1), 141- 157.

Salomon, G. (1992). New challenges for educational research: studying the individual within learning environments. Scandinavian Journal of Educational Research, 36(3), 167-183.

Schmuck, R., Schmuck, P.A. (1974), A Humanistic Psychology of Education: Making the School Everybody's House, Palo Alto, CA: National Press Books.

Schreiber, B.J. (2002). Institutional and student factors and their influence on advanced mathematics achievement. Journal of Educational Research, 95(5), 274 – 286.

Schunk, D. H. (1991). Self-efficacy and academic motivation. Educational Psychologist, 26, 207-231.Schunk, D.

H., & Pajares, F. (2004). Self-efficacy in education revisited: Empirical and applied evidence. In D. M. McInerney & S. Van Etten (Eds.), Big theories revisited (pp. 115-138). Greenwich, CT: Information Age.

Sharan, S., Kussell, P., Hertz-Lazarowitz, R., Bejerano, Y., Raviv, S., Sharan, Y. (1985). Cooperative learning effects on ethic relations and achievement in Israeli junior high school classroom. In: Slavin et al. (Eds.), Learning to Cooperate, Cooperating to Learn, New York, London: Plenum Press, 313-344.

Slavin, R. E.(1990). Cooperative Learning: Theory, Research and Practice. Englewood Cliffs, NJ: Prentice-Hall.

Stiggins, R. J. (2005). Student-Involved Assessment FOR Learning. New Jersey: Pearson Prentice Hall.

Toseland, R. W., Jones, L. V. & Gellis, Z. D. (2004). Group Dynamics. In: Charles D. Garvin, Lorraine M. Gutierrez, Maeda J. Galinsky(Eds). Handbook of social work with groups, (pp. 13-31). New York, NY, US: Guilford Press.

Papinczak, T., Young, L., Groves, M. & Haynes, M. (2008). Effects of a Metacognitive Intervention on Students' Approaches to Learning and Self-Efficacy in a First Year Medical Course. Advances in Health Sciences Education, 13, 213–232.

Walberg, H. J. & Anderson, G.J. (1968). Classroom climate and individual learning. Journal of Educational Psychology,59, 414 -419.

Weiner, B. (1984). Principles for a theory of student motivation and their application within an attributional framework. In R.E. Ames & C. Ames (Eds.), Research on Motivation in Education (pp.15-38). New York: Academic Press.

Weiner, B. (1986). An attributional theory of motivation and emotion. New York: Springer-Verlag.

Zedan, R. (2005). Characteristics for the mathematics teachers in the junior school in the Arab sector, A.L.H.-newssheet for mathematics teachers, 35, 48-55. [Hebrew]

Zedan, R. (2010). New dimensions in the classroom climate. Learning Environments Research, 13, 1, 75-88.

Zedan, R. (2011). Class climate and personal, educational and cultural characteristics. Studies in education management and organization, 32, (in press). [Hebrew]

Zeidner, M. (1998). Test anxiety: The state of the art. New York: Plenum Press.

Zilberstein, M. et al. (2001). Fostering a learner with self direction: pedagogy of case literature, Tel Aviv: Mofet Institute. [Hebrew]

Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. Contemporary Educational Psychology, 25, 82–91.

Appendix

Table 1: Cronbach Alpha Reliability, Mean and Standard Deviation for the Eight Dimensions of the Mathematical Classroom Climate

	Items	Mean	S.D	Cronbach α reliability
Satisfaction and enjoyment	1, 7, 12, 23, 35	3.70	0.98	0.837
Teacher support	6, 8, 10, 30, 33, 34, 39	3.65	0.84	0.812
Rules and instructions	2, 9, 20, 24	3.85	0.83	0.721
Inequality	19, 29, 37	1.93	0.94	0.713
Tension	18, 21, 27	2.63	0.95	0.620
Unsuitable behaviors	3, 4, 28, 32	2.95	0.99	0.723
Competitiveness	13, 17, 26, 38, 40	3.69	0.83	0.718
Difficulty	16, 25, 31	2.55	1.04	0.739
Mathematical self efficacy	1 – 11	3.79	0.77	0.902

Table 2: Pearson Correlation Coefficients between Classroom Climate Dimensions, Math Self Efficacy and Math Achievement

	Math self efficacy	Math achievement
Satisfaction and enjoyment	0.643***	0.399***
Teacher support	0.537***	0.285***
Rules and instructions	0.617***	0.327***
Inequality	-0.138**	-0.162**
Tension	-0.090*	-0.115**
Unsuitable behaviors	0.044	-0.020
Competitiveness	0.405***	0.206***
Difficulty	-0.296***	-0.262***
Math achievement	0.504***	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$