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The Influence of Teaching Geometry by Computer Integrated Method on Self-efficacy, Attitudes toward Geometry, Classroom's Climate and Achievements among Colleges Trainees

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Authors' contributions

This work was developed in collaboration by the both authors, who contributed equally to the literature review and writing of the manuscript. Both authors read and approved the final manuscript.

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ABSTRACT

This article represents a quantitative research which dealt with examination of the correlation between the personality parameter - self-efficacy for learning geometry, and the emotional parameters - attitudes toward geometry and classroom's climate during the geometry lesson as well as the cognitive parameter – geometric efficacy and the academic parameter – studies' achievements in geometry, among teaching students in Arab collages for qualifying teachers in Israel, as an experimental function of learning surroundings: The first – traditional, and the other - a high-tech learning environment, supported by computing and Telecommunications. Thus, the research tested 224 students who learn in three Arabic collages for teachers' qualification, the students who are taught by the two methods of instruction (traditional and computer integrated). The research's variables measurement was used in validated and reliable questionnaires that were used in earlier researches, but were customized to this research's subject and population, and they were analyzed by a factors' analysis that produced new factors that built the research's model. The findings indicate this notion because students who learned geometry in the frontal method reported

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more on having fun, enjoyment and content with learning geometry than students who learned with the computer integrated method. However, students who were taught by the computer integrated method reported more on clarification and observance of rules and guidelines by the teacher, than students who learned geometry by the frontal method, who also reported more on receiving encouragement and support from the teacher, unlike the computer integrated students who reported more on a discriminative treatment of the teacher - on the ground of gender or achievements. In general, the students who learned in the frontal method reported on a more positive perception of the classroom's atmosphere than students who studied geometry by integrating computer.

It was also found that students who learned geometry by the integration of computer, were found as having a higher and a more positive self-efficacy of learning in the combination of computer than students in the frontal method's group. Additionally, the perception of the team learning's dimension among students who learned with a combination of a computer was higher than those learned by the frontal method, and it was also found that general self-efficacy for learning, among students who learned with a combination of a computer was higher than those who learned with the frontal method after the course. It was also found that the attitude of the frontal method's students towards geometry was more positive than the attitude of those students who learned with the computer integrated method. As for geometric self-efficacy, it was found that students who learned geometry with the frontal method, are with a higher geometric self-efficacy than those who learned with the computer integrated method. It was also found that the achievements of the frontal method's students are higher than those who learned by the computer integrated method.

Moreover, it was discovered that, the dimension of perceiving geometry as fun, enjoying and contenting among students taught by the integration of a computer declined when the course ended, though the dimension of the teacher's guidelines and rules increased, and the teacher's support and encouragement declined, and the perception of the classroom's general atmosphere declined as well, and became less positive than in the beginning of the course. The attitude of the computer integration method's students toward geometry also declined by the end of the course. It was found that the classroom's atmosphere dimensions and the dimension of general self-efficacy of learning, as well as the dimensions of the attitudes toward geometry, succeed in predicting geometric efficacy. And that a positive position toward geometry, learning efficacy, understanding the solution, and self-confidence, as well as team learning, are strong and significant predictors of geometric efficacy. Another finding is that the classroom's atmosphere's dimensions and the dimensions of self-efficacy of learning, as well as the dimensions of the attitudes towards geometry, successfully predict achievements in geometry. The ability of geometric efficacy to predict achievements in geometry, was found as well. In light of this research's findings, we suggest recommendations that answers the question we, as well as many teachers' educators, are engaging: In what way students should be trained to use technology in teaching in general and in teaching science and geometry in particular?

We recommend on:

- To enlarge the number of courses that requires integrating computerization and telecommunications. In all fields, and in all apprenticeships, in all departments and in all routes.
- To combine computerization in the training of teaching students, hence, a horizontal and vertical expansion is needed, guidance; perennial courses should be planned for the instruction of different disciplines and not only Literacy and Computer Applications.
- Appropriate software and courseware should be obtained.
- A combination of computerization in the pedagogic training program and in the practical experience, by increasing the demand from the student to apply lessons programs that combine computer and telecommunications.
- A mandatory course should be dedicated to the use of a 'smart board' in the class, in the instruction of all subjects.
- The teachers should be trained to use a computer as well.

Keywords: Self-efficacy of learning; geometric efficacy; classroom atmosphere; attitudes towards geometry; studies' achievements in geometry; combining computerization in teaching geometry; Arab collages.

1. INTRODUCTION

Researches that deal with researching the social and educational environments, assume that to a known environment has an influence on the behavior of people who act in it [1]. One of the learning environments is the High-Tech learning environment for teaching geometry, founded on the constructive approach [2]. It is a cooperative learning environment, with computer support, telecommunications and internet, which demands a development of high skills in comprehension of applying concepts in geometry and an ability to analyze and build geometric shapes and structures [3]. It requires from the student to believe in his or her ability to meet the profession's demands in this unique environment. Additionally, the students' point of view has a considerable impact on their self-ability, on their perception of the learning environment and their achievements.

Many researches focused on the pupils' population in school, but a few researches were dedicated to study the subject among students in collages for qualifying teachers. This research is among the rare studies that inquires to explore this issue among teaching students in Arab collages for teaching in Israel.

This study examines the difference in general self-ability of learning, in self-ability to learn geometry, in attitudes towards geometry in the classroom's atmosphere in geometry lessons and in academic achievements, between two learning environments, an environment that combines computers and a traditional environment. Moreover, the research attempts to build a model which explains geometric efficacy and academic achievements on the ground of general self-ability, standpoints towards the subject of geometry and a classroom's atmosphere during the geometry lesson.

The geometry subject is one of the important subjects in the studies programs in all grades of education. In recent years, there is more emphasis on the instruction of geometry, in comparison to the earlier studies program, both in toddlers, elementary and post primary school [4].

Studies have reported on difficulties in learning geometry, a subject perceived as one of the most complicated and difficult subjects among other mathematical fields [5]. One of the reasons for this hardship derives from the logic and deductive structure of geometry, another reason for the struggle in understanding geometry is the gap between the students' level of efficacy and understanding and the teachers' level of instruction [6]. Other studies found that the hardship in learning geometry already exist in the low grades in elementary school [7], these hardships are presented by a low geometric intelligence based on the Van Hiele Ladder [8], and a faulty level of basic skills development. Hoffer [5] claims, that learning geometry, perceived by many pupils as studying a database of boring and incomprehensible proofs, since most of the lesson's duration in the traditional method, is dedicated to learning proofs, rather than developing basic skills. Hoffer named five important basic skills: 1) A visual ability, 2) An ability of verbal expression, 3) Drawing and marking skills, 4) A logical thinking ability, 5) An ability of Implementation.

In accordance to Patkin's conclusions [9], that have shown that the students' level of geometric intelligence, who have learned by computer was distinctively higher than those who have learned in the traditional method by a book and handouts, it was suggested to enhance the installation of technology in the constructive environment supported by courseware of personal computers for students, as well as teachers' training in technology-intensive learning environments. Other studies [10], that compared the learning by a computer to a learning without a computer, pointed on the positive influence of the computer integrated learning on the students' achievements.

1.1 A High-Tech Learning Environment

The new learning environment – High-Tech, is a cooperative learning environment, supported by computers, telecommunications and internet, in which the combination of the technological device enables the teacher a quality instruction and a significant experiential learning for the student as well [2]. An integration of computerization in the instruction opens a new opportunity for improving the quality of the instruction and the instruction's education, which might make some innovations in the education system, in the curricula, teaching methods and organizing them. The changes' direction, force and volume depends on the operation's conditions, in the contents and nature of operating the computer [11].

The instruction of mathematic in general and geometry in particular, that combines technological device, invites motivation for the students for explorative learning and lead them to a conceptual understanding of the learned subjects and concepts, requires great precision in drawing, a learning environment which emphasizes finding solutions for more complicated and complex problem, while brainstorming in the cooperative work environment which requires a profound understanding and implementation in addition to a profound analysis of the problems, when a combination of computerization by geometric programs helps the students to figure problems in correct and clear steps [12].

Researches have shown a clear advantage in learning with a partner or a team over a personal learning with a computer, though the achievements of those who have learned in teams are not distinctively better than those who have learned by themselves, but the interaction between the team's members rises the level of motivation and the personal obligation, as well as the inter-personal communication between the learners improves [13].

In the high-tech learning surrounding, the learning is founded on experimentation and absorbing information from the teacher, the learner tune himself to the learning. The teacher's part in this environment is to be an available and an aware guide for the learner, in his or her personal rhythm, while being observing and directive [14].

On the other, to the frontal method of instruction by chock & board has several limitations in the instruction of abstract concepts mostly in mathematics and geometry when the students need to imagine shapes and to understand the concepts [2]. Computers can eliminate limitations that harden on the students to create geometrical shapes [15]. Computers can be powerful and flexible learning aids [16].

Both learning environments mentioned above have an impact on; the perception of the self-efficacy of learning geometry, on the approaches towards geometry and on the classroom's atmosphere during the geometry lesson, in addition to its impact on the academic achievements. The findings of a research on the combination of computerization in teaching literature among instruction students [17] show a significant improvement in the students' qualifications and skills as well as in their self-confidence. Zedan [18], have found that the level of competitiveness among students of the cooperative method is higher than that of the frontal method students, competitiveness that related to self-efficacy of learning.

1.2 Self-efficacy of Learning

Self-efficacy is defined as an individual belief in his or her ability to act in a certain way or to do a certain mission, or as the individual's assessment of his or her ability to organize the required skills for acting in a certain way and to execute them. According to the theory Bandura [19] suggested, a person who has a high self-efficacy to act in a certain behavior, will believe he can do it successfully, hence, in a lot of cases he will decide to do it and will invest in it maximum effort, and will persist on executing it, even when there are difficulties and obstacles. The conception of self-efficacy does not refer to what skills the individual has or not, but rather to his or her belief and assessment of their efficacy to use their skills. Meaning, this is what will influence on the individual's willingness to perform a certain behavior and to persist in it, and not his or her true ability or talent. That is to say, two people with the same level of efficacy can have different beliefs in their ability to perform certain behaviors. These beliefs, are no doubt, will affect in their turn, on the individual's readiness to perform the behavior and to persist in executing it [19].

The overall self-efficacy perception is not identical to the specific self-efficacy perception, for instance; academic self-efficacy, though it may be affected by it. And it is plausible that the general self-efficacy perception is not identical to the self-efficacy perception to learn geometry, both in the new surrounding and in the traditional environment, it might effect on the teaching students when learning in the suggested environments.

Funkhouser [20], examined the development of reason in students of geometry with the integration of computerization in comparison to those without computers, and they have found that the effect of the computer is presented in the long-term, when it consists as a way of dealing with complex construction problems. As well as leading the development of the learner's reason, so that he can answer questions in high levels of reason in the specific subject of learning.

1.3 Self-efficacy

The term of ‘self-efficacy’ refers to an individual’s beliefs regarding his ability to reach different levels of achievement in a certain task, as well as to his self-sense of worth in regard to his or her ability to organize and implement the required actions for dealing with a situation’s demands [21]. Zimmerman [22], defined self-efficacy as an individual’s self-assessment of his abilities to organize and perform a series of actions in order to achieve a certain goal. This term appeared as a part of a cognitive theory in the social learning field, when self-efficacy does not focus on skills alone, but rather on the assessment of the gap between the belief in the skills and the reality’s requirements, which is the belief in the ability to execute efficiently the required behaviors for producing the outcome [21].

There is a distinction in the research’s literature, between generalized self-efficacy, which is also defined as self-conception [23] that is a general conception of the learner’s ability in a certain profession or field, such as mathematics, languages or sports, and specific self-efficacy that is the conception of the ability in a specific mission in a certain profession. For instance, the conception of the ability to solve equations with two variables [21,24,22].

1.4 Students’ Stands towards Geometry

“A stand - defined as positive or negative inclinations toward the object, an idea or a situation, as well as the willingness to respond in a predetermined manner to objects, situations or any other concepts related to them (Petkin, 1994.3).” The students’ stand has a considerable impact on their achievements, for example, Bloom [25] found that a high percentage of the variance in learning achievements of students is explained by their emotional characteristics, even before the beginning of any learning process. The success of those who learn by a certain approach, referring to their stand and attitude towards the profession and/or the subject they learn, is one of the dilemmas that required explanation and clarification, especially when combining a computer in the teaching [26].

Funkhouser [20], found in his study that students who learn geometry by computer programs in the constructivist approach, achieve higher achievements in knowledge about geometric concepts than students that learn in the traditional way. However, they do not develop a more positive attitude towards mathematics than those who learned traditionally. This finding is similar to Ilaiyan and Zedan [27] who have found that the perception of the classroom’s atmosphere and its dimensions by the students who learned mathematics in the frontal way is more positive than the approach of those who learned by the cooperative approach. Hoffer [5] claims that the teaching students’ stand in their first year, towards geometry was negative, and that it is the students’ less favored subject amongst all the other mathematic subjects. Already in 1982 Robert [28] have studied the correlation between achievements in geometry and the attitudes towards it, and have found a difference between the weak and the strong students. The weak students did not like geometry while the strong ones found a sympathetic and amiable attitude towards it.

1.5 Classroom’s Climate

Classroom’s climate is a set of features that integrate with each other and work as a dynamic whole, this system includes inter-personal relationships, emotional tone, structural aspects of teaching style, classroom organization, teacher and student expectations and attitude towards them, the teacher’s level of control, disciplinary issues, the students’ sex and age and etc. The concept of “climate” also includes nationality, origins or religion that the students and the teachers relates to [29].

The classroom’s climate, as known as classroom’s atmosphere, consist an educational surrounding for the learner, it engages psychic-social processes that occur between the teacher and the students and between the students themselves, perceived by each and every one of them [30]. Meaning, it is a perceptional subjective concept, defined as a collection of perceptions of all the working minds in the system, and they consist a critical element in the students’ mental design and disposition [31].

Fraser and Tobin [32] agree that the classroom’s atmosphere influences on the student’s behavior, level of knowledge, academic achievements, motivation, self-image, his or her positions towards the subject, the classroom and the school, and towards teaching and education in general. Hitherto, the exploration of the factors that affect the atmosphere in the classroom allows us to identify between social processes that act in the classroom, and to explain the students' behavior in the cognitive and emotional plain.

Most researches for studying and measuring the climate in the classroom [18] approve the opinion that that is a tight connection between the perception of the classroom's climate by the students and their social, personal and academic variables, and that a positive climate increase the students sense of self-worth and advances their academic performances. Salomon [33] claim that while examining and measuring the climate in the classroom additional variables should be taken in account, such as: the certain subject in which the climate is going to be examined, the type of the class, the nature of the country and the settlement, cultural and personal variables as well as the current teaching method.

1.6 Academic Achievements

The term "Academic Achievements" refers, in its definition and measurement, to related elements, such as: personal knowledge, academic ability, learning skills, stands, success and failure, it is also connected to the number of personality variables, such as: Self-image, level of ambitions and socio-economic status, academic achievements set and defined in accordance to the teacher's quantitative and / or qualitative evaluation, the evaluation is a consistent examination of value and quality of a certain subject (Fresco, Verthaim and Lazobski, 2011). Cotton [34] points out several factors that support academic achievements, such as: safe and organized learning surrounding, learning advocating ambiance, efficient use of study time, quality teaching.

1.7 The Research's Assumptions

1) A distinctive difference will be revealed in self-efficacy to learn, in stands towards geometry, the classroom's atmosphere during geometry lesson, in geometric self-efficacy and in achievements in geometry among teaching students who have learned in a new and computerized environment as oppose to those who have learned in the traditional way.
2) Self-efficacy, stands towards geometry, and the classroom's atmosphere presents in a distinctive extent the academic achievements in geometry and the geometric self-efficacy.

2. METHODS

2.1 The Research Design

This is an experimental quantitative adaptor research, so that the research's variables (self-efficacy to learn, geometric efficacy, stands towards geometry and classroom's atmosphere during geometry lesson) were measured in the beginning of the school year, some of the students learned geometry in the frontal way- the control group, and others learned by a combination of the computer- the experimental group, with the end of the course the variables were measured for a second time.

The design of this study, allows examination of the change that will be on their self-efficacy to learn, on the geometric efficacy among the students, and the teaching students' stands towards geometry as a result of learning it with a computer, it will also examine the change that the classroom's atmosphere will have during a geometry lesson. In addition to the examination of the difference between the experimental group and the control's, in the examined variables will also check the connections between them for the degree of predictability of geometric efficacy variables and academic achievements according to the proposed model, will be shown below.

When the main part of learning geometry is with a computer, it is conducted by the use a dynamic computer program, which was especially developed for teaching geometry for secondary school. They are also compatible to individuals as well as to working in groups. When there is an interaction between student-teacher-computer, while assisting E-mail and internet, the geometric program is user-friendly with an easy access to drawing and colorful sketching, which helps to analyze and figuring out more complex problems. This research used the computer programs of; the Geometric Approximator, Pythagoras, Gogebra and Wingeom.

2.2 The Sample

226 students of 1st, 2nd and 3rd year participated in this study, trainee students in Teaching Certificate Route and a B.Ed specializing in mathematics, early childhood, special education, languages and science (chemistry/biology), who learn in eight different classes with five lecturers from three different Arab collages in Israel. 107

students (47.3%) learn geometry frontally, and 119 (52.7%) learn geometry with a computer.

2.3 The Research Tools

2.3.1 A questionnaire for measuring the classroom's atmosphere during geometry lesson

A constructed questionnaire for measuring the classroom's atmosphere during geometry lesson according the students' perception (attached A), the original questionnaire addresses measuring the perception of the classroom's atmosphere during a mathematics lesson [35], the questionnaire was modified for measuring the atmosphere during geometry lesson. The questionnaire is constructed by the Likert Ladder structure, it included 40 questions, all of them were closed questions, the students were asked to mark their level of agreement with every item by a succession of five degrees: (1) certainly not true, (2) not true, (3) true to some extent (4) true (5) certainly true. A number of items were phrased negatively to prevent an array of response in order to not receive answers that do not address to the items' phrasing. The items comprise five elements: satisfaction and enjoyment, student-teacher relations, tension and gender inequality, student to student relations (interpersonal relations) and competitiveness.

2.3.2 A questionnaire for measuring perception of self-efficacy to learning

The questionnaire is mainly based on Bandora's models [19,36,37], as it appears in Nili Mor's doctorate, the ques questionnaire tioner is dated and distinct between three dimensions of self-efficacy of learning, that are required for an efficient function in the suggested learning environment [18]. The questionnaire is constructed by Likert Ladder structure, it included 24 questions, all of the questions were closed, the students were required to mark their level of agreement with each item in succession of four levels: (1) do not describes me at all, (2) describes me to a small extent, (3) describes me to a mediocre extent, (4) describes me a lot.

2.3.3 Perception of self-efficacy in geometry

Questionnaire of self-efficacy in geometry: the questionnaire included 11 phrases, the questionnaire was adopted from the research of Birnbaum and Nasser [38], but was converted and modified to geometry, the original questionnaire examined self-efficacy in mathematics among Arab and Jewish students.

2.3.4 Students' positions toward geometry

A constructed questionnaire which examines the students' positions toward geometry, both in the research group and the control group, while they are examined before and after the experiment. The questionnaire items related to numerous subjects both in the cognitive plain as well as in the effective plain, when the student is asked to express his opinion on the profession of geometry and its importance, on the teaching method, on his achievements, and his attitude toward geometry in general. The original questionnaire was designed for examining the students' stand points toward the subject of statistics [39,40], and for this present research the questionnaire was modified by the researchers in the field, for the examination of the stand points toward geometry.

2.3.5 A test for measuring achievements in geometry

A test that examine the level of the students' dominancy in concepts and procedures of solution in geometry. According to Van Hila's principles.

Before the process of exploratory factors analysis, the following indexes were examined: Skewness, Kurtosis, diagnosis factor, variance, normality, communality, means and standard deviations of the four items of the questionnaire, it was found that all of the indexes are in the accepted field, so it was decided to carry out an analysis of factors that may be incorporated all of the items.

By assuming dependence between the factors, counting on the theory that exist in the field, an exploratory factors analysis was held by the method of Principle Axis Factoring with Direct Oblimin Rotation.

3. FINDINGS

3.1 First Assumption

A distinct difference will be discovered in relation to the perception of self-efficacy of learning, to positions toward geometry, to the classroom's climate during the geometry lesson, and to self-efficacy and to achievements in geometry between Teaching students who have learned geometry in a new computerized and telecommunicated environment in comparison to students who have learned in the traditional frontal method.

We have examined the difference between the control group after the geometry course. Board no.2 in the appendix presents the averages and standard deviations of the dimensions of the self-efficacy of learning perception, positions toward geometry, the classroom's atmosphere during the geometry lesson and geometric self-efficacy, among two groups that passed the course, as well as presenting the values of 't' test for independent samples for the difference between the two groups after the course.

The findings point out clear differences between the control group students (who have learned geometry frontally) in comparison to the experimental group students (who have learned by a computer) after the course, in the perception of the classroom's climate, fun enjoyment and content, guidelines and rules, the teacher's support and encouragement and in the general climate. It has been found that students who have learned in the control group reported on having fun, enjoyment and content in learning geometry, more than students who have learned in the group of the telecommunication course. Students in the experimental group reported on rules and guidelines of the teacher, more than students in the control group. Students in the control group reported more on teacher's support and encouragement than students in the experimental group. Students in the control group reported more on a more positive perception of a general classroom's climate, than those of the experimental group.

It was also found, that there are differences between the students of the control group (who learned geometry frontally) and students of the experimental group (studied by a computer) after the course in the perception of; the self-efficacy of learning dimensions, studying by a computer, studying within a team and general self-efficacy of learning.

Students in the experimental group (who learned by a computer) were found with a higher self-efficacy of learning with a computer more than those in the control group. In addition, the dimension of learning within a team, among students in the experimental group was found higher than those in the control group. And it was also found that, general self-efficacy of learning among students from the experimental group, is higher, than among those from the control group who passed the course.

It was found that there is a distinct difference as well, in the positive attitude toward geometry and in the negative attitude toward geometry, and in the general attitude towards it, students who have learned frontally. reported on a higher positive stand, as well as on a lower negative stand and a more positive general stand towards geometry, than students who learned by a computer.

It was found that there is a distinct difference in geometric self-efficacy between students of the control group (learned frontally) and students of the experimentation group (learned with computer) after the course, geometric self-efficacy among students in the control group is higher than the students of the experimental group.

It was also found that there is a distinct difference in achievements in geometry between students in the control group (learned frontally) and those in the experimental (learned with computer) after the course, achievements in geometry among the control group are higher than those in the experimental.

The difference in self-efficacy of learning was examined as well, in attitudes toward geometry, in classroom's climate during geometry lesson and in geometric self-efficacy before the course in comparison to the dimensions' perception after the course among the experimental group. Board A in the appendix, presents the averages and standard deviations of the dimensions of self-efficacy of learning, positions toward geometry, the classroom's climate during geometry lesson and geometric self-efficacy, and the values of 't' test for independent samples for the difference before and after the course among students in the experimental group.

The findings point out the distinct differences between students in the experimental group, before and after the course, in their perception of the classroom's climate, and fun, enjoyment and content, rules and guidelines, teacher's support and encouragement and general classroom's climate. The perception of the fun, enjoyment and content dimension of the students in the experimental group that passed the course is lower than before the course, meaning, within the

Table 1. Factor analysis results for the questionnaire, means and standard deviations for the factors

Questionnaire	Factor	Items	Mean 5 – 1	Standard deviation	Cronbach's alpha
Classroom Climate	Fun, enjoyment and satisfaction	16, 12, 7, 5, 1, 31, 28, 25, 23, 35	3.62	0.71	0.874
	Competitiveness	20, 17, 15, 13, 40	3.29	0.57	0.550
	Guidelines and rules	36, 24, 9, 2	2.14	0.55	0.511
	Teacher student ratios, support and encouragement	22, 10, 8, 6, 38, 34, 33, 30, 39	3.52	0.54	0.745
	Discriminates on the teacher's reference	29, 19	1.29	0.45	0.582
	General climate	8, 7, 6, 5, 2, 1, 13, 12, 10, 9, 19, 17, 16, 15, 24, 23, 22, 20, 30, 29, 28, 25, 35, 34, 33, 31, 40, 39, 38, 36	3.20	0.33	0.753
Geometry self efficacy	Geometry study combined computer	19, 13, 9, 7, 24	2.57	0.72	0.855
	Ability to learn understanding and solving, successful security	17, 12, 8, 4, 1, 22, 20, 18	3.56	0.40	0.700
	Group learning	16, 14, 10, 2, 23	3.07	0.52	0.702
	General self efficacy	24-1	2.97	0.30	0.724
Attitudes toward geometry	Positive attitude: interest, enjoyment, importance, ease, comprehension	8, 7, 5, 4, 1, 16, 15, 14, 10, 20, 19, 18, 17, 21	3.68	0.73	0.920
	A negative attitude: difficulty, fear, and insecurity	11, 9, 6, 3, 2, 23, 22, 13, 12	2.78	0.83	0.891
	General attitudes toward geometry	23-1	3.50	0.72	0.945

experimental group, the enjoyment and content declined significantly along with the end of the course. The perception of the rules and guidelines dimension increased after the course, the dimension of the teacher's support and encouragement declined by the end of the course, and the perception of this dimension before the course was higher than afterwards, among the experimental group.

Additionally, the general classroom's climate among the experimental group, after the course, is lower than that before, hence, a decline in the classroom's climate was initiated in the geometry lesson that is conducted by the telecommunication method.

It was also found that a decline in the students' positive attitude began after the course than before it, hitherto, their position after the course was less positive.

3.2 Second Assumption

Self-efficacy of learning, positions toward geometry and classroom's climate explain to a distinct extent the geometric efficacy and the academic achievements in geometry, and geometric self-efficacy, as predictors of achievements in geometry.

Model No.1 (Appendix A.)

For the examination of the assumption and the suggested research model, Multiple linear regression analysis has been conducted, while in the first stage the dimensions of classroom's climate, along with the dimensions of general self-efficacy of learning, and the positions toward geometry dimensions, were all inserted as independent variables for predicting geometric efficacy. In the second stage, the variable of achievements in geometry, was inserted as a dependent predictable variable, and in the third stage the variable of geometric efficacy was inserted as an independent variable for predicting the variable which is depend on achievements. Boards 2 and 3 presents the regression analysis for all of the aforementioned stages.

Regression analysis for predicting geometric efficacy, counting on the classroom's climate dimensions, and the self-efficacy of learning dimensions, along with dimensions of the positions toward geometry, brought up that the regression model is clear ($f_{(10,174)}$=43.475, p<0.001), and the predictors; the classroom's climate dimensions, and the general self-efficacy of learning dimensions, along with dimensions of the positions toward geometry, brought up that the clear regression model and that the indicators of classroom's climate dimensions, and general self-efficacy of learning dimensions, along with dimensions of the positions toward geometry, explain 71.4% of the geometric efficacy variance.

It has been found that a positive attitude toward geometry is the most significant indicator for an experiment in geometric efficacy (Beta=0.602, p<0.001), and that the dimension of learning ability, figuring a solution and self-confidence in self-efficacy of learning is a clear indicator for geometric efficacy as well (Beta=0.242, p<0.001). It was also found that, the dimension of learning within a team in relation to the dimension of self-efficacy of learning is a distinct indicator for geometric efficacy (Beta=0.136, p<0.01).

A regression analysis for predicting achievements in geometry, counting on the classroom's climate dimensions, and in self-efficacy of learning dimensions, and the dimensions of positions toward geometry, has brought up that the regression model is clear ($f_{(10,85)}$=28.532, p<0.001) and that the indicators: the dimensions of general classroom's climate and classroom's climate, along with dimensions of general self-efficacy of learning and the dimensions of positions toward geometry explain 77.0% of the variance of achievements in geometry.

A positive attitude toward geometry has been found as a strong indicator of achievements in geometry (Beta=0.436, p<0.001), and a negative attitude towards geometry succeed predicting achievements in geometry as well.

The dimension of learning efficacy, figuring a solution and self-confidence in self-efficacy of learning are clear indicators for achievements in geometry (Beta=0.289, p<0.001). Regression analysis for predicting achievements in geometry, counting on geometric efficacy, brought up that the regression model is clear ($f_{(1,116)}$=399.44, p<0.001), and that efficacy in geometry explains 77.5% of the variance of achievements in geometry (Beta=0.880, p<0.001).

3.3 The Findings of the Third Assumption May be Concluded by the Following Model

Model no.2 (Appendix B.)

In addition to the models that refers to the classroom's climate dimension, and to the self-efficacy dimension, and to dimensions of the positions, another model was analyzed which refers to the general classroom's climate, in regard to general self-efficacy and to general positions, as indicators for geometric self-efficacy and achievements in geometry, according to the following model:

3.4 This Assumption Will Examine the Model no. 3 (Appendix C.)

Regression analysis for predicting geometric efficacy, counting on general classroom's climate, self-efficacy of learning and the positions toward geometry, has brought up that the model regression is distinct ($f_{(3,216)}$=137.319, p<0.001), and that the indicators for classroom's climate, for general self-efficacy of learning and positions toward geometry, explain 65.6% of the variance of geometric self-efficacy.

It has been found that the variable of positions toward geometry, is the most significant indicator for predicting geometric efficacy (Beta=0.739, p<0.001), and that the self-efficacy of learning variable is a distinct indicator for geometric efficacy (Beta=0.182, p<0.001).

A regression analysis for predicting achievements in geometry, counting on general classroom's climate, self-efficacy of learning, and positions toward geometry, brought up that the regression model is distinct ($f_{(10,85)}$=104.794, p<0.001) and that the indicators: general classroom's climate, self-efficacy of learning and the positions toward geometry, explain 73.4% of the variance of achievements in geometry.

Table 2. Regression analysis results for predicting geometry self efficacy by classroom climate and attitudes toward geometry

Factor	B	S.E.	Beta	t
Fun, enjoyment and satisfaction	.010	.080	.010	.122
Competitiveness	.063	.052	.054	1.221
Guidelines and Rules	-.031	.059	-.027	-.531
Teacher student ratios, support and encouragement	-.049	.064	-.040	-.762
Discriminates on the teacher's reference	-.060	.061	-.042	-.989
Geometry study combined computer	-.081	.043	-.088	-1.880
Ability to learn understanding and solving, successful security	.394	.083	.242	4.724***
Group Learning	.175	.062	.136	2.837**
Positive attitude: interest, enjoyment, importance, ease, comprehension	.581	.075	.602	7.783***
A negative attitude: difficulty, fear, and insecurity	-.048	.058	-.058	-.834

Table 3. Regression analysis results for predicting geometry achievement by classroom climate and attitudes toward geometry and self efficacy

Factor	B	S.E.	Beta	t
Fun, enjoyment and satisfaction	1.493	1.800	.086	.829
Competitiveness	-.263	1.195	-.012	-.220
Guidelines and Rules	-.165	1.398	-.008	-.118
Teacher student ratios, support and encouragement	.330	1.683	.014	.196
Discriminates on the teacher's reference	-1.449	1.442	-.057	-1.005
Geometry study combined computer	-.005	1.004	.000	-.005
Ability to learn understanding and solving, successful security	7.711	1.847	.289	4.176****
Group Learning	1.777	1.512	.075	1.175
Positive attitude: interest, enjoyment, importance, ease, comprehension	7.472	1.650	.436	4.529***
A negative attitude: difficulty, fear, and insecurity	-2.936	1.245	.086	.829

Table 4. Regression analysis results for predicting geometry self-efficacy

Variable	B	Beta	S.E.	t
Classroom climate	.070	.035	.111	.632
Attitudes toward Geometry	.698	.739	.052	13.525***
Self learning capacity	.410	.182	.091	4.485***

Table 5. Regression analysis results for predicting geometry achievement by classroom climate and attitudes toward geometry and learning self capacity

Variable	B	S.E.	Beta	t
Classroom climate	2.863	2.392	.085	1.197
Attitudes toward geometry	12.914	1.174	.769	10.997***
Learning self capacity	5.228	1.883	.137	2.777*

The variable of positions toward geometry has been found as the most significant indicator for achievements in geometry (Beta=0.769, p<0.001). It was also found that, the self-efficacy of learning variable is a distinct indicator of achievements in geometry (Beta=-0.137, p<0.05).

Regression analysis in order to predict achievements in geometry, counting on geometric efficacy, brought up that the regression model is distinct ($f_{(1,116)}$=399.44, p<0.001), and that geometric efficacy explains 77.5% of the variance of achievements in geometry (Beta=0.880,p<0.001).

Model no. 4 (Appendix D.)

4. DISCUSSION

4.1 Classroom's Climate

The findings of the current research pointed out clear differences between students who have learned frontally and those who have learned geometry by computer integrated method, in the way they perceive the classroom's climate dimension, fun enjoyment and content, rules and guidelines, the teacher's support and encouragement and in the perception of the general classroom's climate. It has been found that, students who have learned frontally, reported on fun enjoyment and content, more than students who have learned by the computer-integrated method.

The current research's findings about the more positive perception of students who have learned geometry frontally, contradicts the findings of Hoffer's research [5], who claims that; learning geometry, is perceived by many students, as learning a stock of boring and incomprehensible proofs, since most of the learning time conducts in the traditional way and is dedicated for learning proofs, rather than developing basic skills.

However, this finding consistent with the finding of Ilaiyan & Zedan [41], that showed how the level of content and enjoyment among students in elementary schools, who learn mathematics frontally, is higher than the level of content among students who learned by computer-integral method.

Perhaps it stems from the traditional nature of the Arabic society, where the individual is accustomed only to listen and obey, rather than taking an active part in a certain process. The traditional Arabic society is characterized by conformism and humoring the patriarch's wants and instructions [36], and in the classroom, it is the teacher. Moreover, the nature of an Arabic school's regime, is not democratic [42]. This character contradicts the basics of cooperative learning, where a pupil should be active and he teacher is an advisor and a guide, as opposed to the frontal learning, where the pupil is passive and only the teacher can impart knowledge.

The current research's findings pointed out that; students who have learned geometry by computer integrated method, reported on the perception of the dimension of the teacher's rules and guidelines more than those who have learned frontally.

In the Arabic society, clear boundaries exist between parents and children, and the space that is given to the children should not brake the familial nor the social order. The Arab students receive the intervention of their parents and teachers, both in their private and academic lives, and this is the mark of the traditional Arabic society's nature, structured by patriarchy, where the father dominant the pyramid and the relations between the family members is built upon ultimate dependency in all walks of life and matter, and upon compliance and responsiveness to the wishes and instructions of the family's patriarch [36]. The current research findings pointed out that, students who have learned geometry by computer-integrated method reported more on perceiving the teacher's rules and guidelines dimension than students who have learned geometry frontally.

Hitherto, the recognition and respect that are granted to the teacher in the Arabic sector are greater, in comparison to other western sectors and cultures.

The Arabic teacher's status is still preserved as an authority and fatherly figure, who is authorized to force norms of behavior and even punish. The discipline is one character of the Arab education characters, the pupils still treat the teacher with respect and do not allow themselves to "talk back" during the lesson, nor braking the rules and the classroom norms. This figure was mostly prominent in the findings of Zedan's research (2010).

Zedan's findings (2010), brought up that the mathematics' teacher shows a large extent of helping, supporting, interest and friendship towards the pupil. He gives a lot of clear guidelines and keeps order and discipline, as well as on conducting a clear system of rules and regulations, that the students are aware of it, and of the consequences of braking it. It states the degree of rigidity of the teacher, enforcement of rules and regulations, the persistence of punishment for their violation, and monitoring undesirable behaviors.

The findings of this current research, pointed out that students who have learned geometry frontally, reported on teacher's support and encouragement more than those who have learned by computer-integrated method, these findings support Ilaiyan & Zedan's findings [27], who have found that students report on Teacher's support and encouragement in a lesson that conducted frontally more than in a lesson that conducted in the cooperative method. Though this finding contradicts other researches findings, that were meant to do a comparison of the computer-integrated method in teaching, in opposition to other teaching methods, researches have reported that in this method, the main role of the teacher is to be an available and an aware teacher to the learner, in the learner's personal rhythm while observing and directing [43,14].

In general, it was found that students who learned geometry frontally reported more on positive perception of the general classroom's climate than students who learned by the computer-integrated method. This finding supports Ilaiyan & Zedan's findings [41], who found that the perception of the classroom's climate and its dimensions by the students who learned mathematics frontally, was more positive than those who learned cooperatively.

The findings and the interpretation, given to them above, found support in the completing findings that the current research brought up. When it was found that a change that occurred in the perception of the classroom's climate dimension, during geometry lesson, and in the dimensions of general self-efficacy of learning, and the geometric efficacy, and on the positions toward geometry, distinctive differences have been found between the students' perception of these dimensions before the computerized - telecommunicated geometry course. And their perception of these dimensions after the course, the differences were fined distinctive in relation to the perception of the classroom's climate dimension, fun enjoyment and content, rules and guidelines, teacher's support and encouragement and general classroom's climate. It has been found that the students' perception of the enjoyment and content dimension who have learned geometry by computer-integrated method after the course, is lower than the perception before the course, the enjoyment and content declined significantly with the end of the course. The perception of rules and guidelines dimension after the course, has increased, meaning, there is a strict enforcement of rules and clear instructions during the telecommunicated – computerized geometry lesson. The dimension of the teacher's encouragement and support has declined with the end of the course as well. In addition, the perception of the general classroom's climate among the experimental group, after the course, is lower than that of before the course, meaning, a decline in the perception of the general classroom's climate began during geometry lesson that conducts by the telecommunication method.

4.2 Self-efficacy

Differences have been between students who have learned geometry frontally and those who have learned with computer-integrated method, in the perceptions of the self-efficacy of learning dimensions, the dimension of learning with a computer, learning within a team and in the perception of the general self-efficacy of learning. Students who have learned with computer-integrated method, were found to have a higher self-efficacy of learning with a computer, than those who have learned frontally. Additionally, the learning within a team dimension among students who have learned with a computer, has been found higher than among students who have learned frontally. And that general self-efficacy of learning among students who have learned geometry with a computer, is higher than that of among students who have learned geometry frontally.

The finding that the current research has brought up, notes that, students who have learned geometry with a computer were found as having a higher self-efficacy of learning with a computer, than those who learnt frontally, and that their general self-efficacy of learning is higher than students who learnt frontally, and it is supported by the findings of Patkin study [9], which pointed out that the level of intelligence of students in geometry, who have learnt with a computer was distinctively higher than those who have learnt traditionally – by a book and handouts.

It was also found that in relation to self-efficacy, the dimension of learning within a team, perceived positively to a certain extent by students who have learned with a computer, more than those who learned frontally. This finding is appropriate to the definition of computer-integrated learning, which develops the efficacy of learning within a team, an experiential, cooperative and grouped learning , which was defined as collaborative learning environment, supported by the computer, telecommunications and the Internet, which integration of recent technological tool allows quality teaching for the teacher, and a meaningful and experiential learning for the student, it also gives students motivation to explorative learning [12]. Studies have also pointed out the advantage of learning with partners and within a team, over learning singly with a computer, though the learners' achievements within teams are not distinctively better than single learning. However, the interaction between the teams, increases the level of motivation and personal commitment, and the interpersonal communication between learners improves [13].

The findings highlight the advantage of the computer-integrated teaching method, so the high-tech learning environment nurtures and develop independence, initiative as well as exploration skills among students. When the computerized learning method is founded on experimenting and receiving knowledge from the teacher, the learner attune himself towards learning and the teacher's role in this environment is to guide, advise and aiding only if necessary [14]. It might bring up and increase the student's self-efficacy, to increase his faith in his ability to execute any kind of mission, or in evaluating his ability to organize the required skills to act in a certain way and to execute them [19,44]. These beliefs, undoubtedly, will affect in their turn on the student's willingness to perform this behavior and to persist on doing so [19], especially by a computer that can be a powerful and flexible mean of learning [16]. This in contrast to the frontal teaching method, that is a process in which the teacher feeds and pour pre-designed knowledge for the student's memory, while it is a meaningful learning technique, and the emphasis here is on acquiring knowledge more than understanding and practicing it, where the only source of knowledge is the teacher and the student is a passive agent [45].

4.3 Attitudes toward Geometry

A distinct difference has been found between the positive attitude toward geometry and the negative attitude toward geometry as well as the general position toward geometry. Students who have learned frontally, reported on a higher positive attitude toward geometry, over lower negative attitude, and on a more positive general position toward geometry, than students who have learnt geometry with a computer. This finding supports in the findings of Funkhouser's study [20], who have found that mathematics students who learned with a computer, did not developed a more positive attitude toward the subject than those who have learned by the traditional method.

The negative attitude of the students toward geometry is known for a long time, Hoffer [5] claims that the Teaching students' position toward geometry, in their 1st year of school, was negative and that geometry perceived as one of the most complicated and difficult subjects among the other mathematics' fields. One of the reasons for this hardship stems from the deductive and logic structure of geometry [6]. This hardship already exists in the lower grades of elementary school [7], and it is shown by a lower geometric intelligence in accordance to the Van Hiele's ladder [46]. And presumably, the combination of computerization in learning geometry, adds another dimension of difficulty and complication that might increase the disliking and negative attitude of the students toward geometry. This is consistent with the finding about the lower extent of pleasure, satisfaction, and general classroom's climate, perceived by the students who have learned geometry with a computer, as opposed to students who have learned frontally. The rigidness as well as the teacher's rules and guidelines, might make the lesson as less interactive and interesting, thus, a negative attitude develops towards the geometry subject in general. These findings and their interpretation, have found reinforcement in the complementary findings that emerged from this study that pointed out a decrease in the positive attitude of students who have learned geometry with a computer, after the course rather than before it, meaning, their position after the course became less positive.

And this is how we can explain the finding about the difference of geometric self-efficacy between students who have learned with a computer than those who have learned frontally. It has been found that geometric self-efficacy among students who have learned frontally, is higher than those who have learned with a computer. This may be explained by counting on the level of difficulty in the subject of geometry, mostly by the computer-integrated teaching.

After the debate has already been opened regarding the position toward geometry combined with a computer, then you should also discuss the attitude of teachers towards integrating computer in teaching in general, so that the reason for the hardship in understanding the subject of geometry lies in the teacher himself, keeping a gap between the level of efficacy and comprehension of the students and the level of the teacher's teaching might increase the level of hardship of the subject, which might develop in the students a negative attitude towards it [6], hence, the attitude of the teachers who teach geometry with a computer towards the combination of a computer in teaching, in general, is very important for understanding their students' position. The findings of Ilaiyan's & Zedan's study [27], points out that there is a positive connection between, the frequency of the use of teachers in Information Technology for the teaching's requirements, and their personal needs, and their attitudes towards integrating a computer, and vice versa. Teachers with a low level of experimenting, have expressed negative attitudes toward computers, and the study has found a tendency to move away from using computer and internet in their teaching. These findings are valid to students as well, not only to teachers [47].

Since Education and Teaching institutions are appointed to a very large population, the educators' and teachers' positions has an evident impact on their pupils and students, this reflects in the way in which the teaching process is conducted. A combination of computer's communication in the teaching, searching for the tools and the ways to overcome different resistances and hardships that stand in the teacher's way, along with the question; in what way the teachers should be trained to teach in an online environment, occupies many researchers [48].

The teacher stays as the main character in the whole process of education, and the teachers' positive attitude will be made by a right and appropriate training for cooperating a computer in the teaching. One of the elements in the process of planning the studies in the computerized and online age is the teacher, the process of his training in addition to financial resources and other elements.

The technological innovations and application in the academic environment caused in the recent years to a revolution in teaching methods, though not all of the teachers succeed to adapt, in the required speed for the technology implements in the classroom, and they show reactions of resistance [27].

The changes and expectations of the education system has incisive requirements from teachers' training system, as well as the students of teaching disciplines. The teachers will be required to take more responsibility for learning and its functioning, since the combination of a computer allows new opportunities in educating teachers [17].

Since the large piece of specializations and studies curricula in teacher training colleges is the curricula of elementary school, early childhood and special education, the teachers' instructors' duty, in these specializations and studies curricula, will be to develop their students' ability to dominant in the computer technology in order for them to be assisted, and use it as a teaching tool with a tremendous contribution [35]. But if the teachers' instructors cannot do it, or that their position toward combining a computer in the teaching is negative, how will the Teaching students will acquire theses skills? and what is the message and what is the method that the Teaching students will adopt and implement when they get out to the field, whether during the experimented practice, or as beginning teachers or even interns. While it is clear that Teaching students mostly arrive to schools with a motivation to succeed, they can influence greatly on the combination of information technology in the education system [17].

4.4 Academic Achievements

Another distinct difference has been found between students who have learned geometry frontally and those who have learned with a computer, in their achievements in geometry. The achievements of the students who learned frontally were higher than those who have learned with a computer. This finding contradicts with other researches' findings, hence, many researches have confirmed the computer's contribution to the improvement of achievements in general, and to the "problematic" geometry in particular [9]. Funkhouser [20], for instance, has found that students who learn geometry by computer programs, achieve higher achievements in knowledge of geometric concepts, than students who learns geometry traditionally. Other studies that compared the learning by a computer to learning without computer, pointed on a positive influence of the learning with a computer on the students' achievements, Hancer & Tüzemen [10], have found that teaching science with a computer, is positively influential and contributes to the improvement of academic achievements.

This research's findings also pointed on that the dimensions of the classroom's climate and the dimensions of the general self-efficacy of learning, along with the dimensions of the positions towards geometry, indicate geometric efficacy and explain more than two thirds from the variance of the geometric efficacy. It has been found, that a positive attitude toward geometry is the most significant indicator of geometric efficacy, and that the dimension of learning efficacy, figuring a solution and self-confidence in the self-efficacy of learning, is a distinct indicator of geometric efficacy as well. It was also found that the dimension of learning in a team in relation to self-efficacy of learning, is a distinct indicator of geometric efficacy.

It was also found that, the dimensions of the classroom's climate and the general classroom's climate, as well as the dimension of general self-efficacy of learning along with the dimension of the positions toward geometry, succeed to predict achievements in geometry, and that they explain more than three courters of the variance of achievements in geometry. It has been found that a positive attitude toward geometry is a significant indicator for achievements in geometry, and a negative approach toward geometry succeed to predict achievements in geometry as well. It was also found, that the dimension of learning efficacy, figuring a solution and self-confidence in the self-efficacy of learning, is also a distinct indicator for achievements in geometry.

The findings also suggested that, geometric efficacy predicts achievements in geometry and succeed to explain more than three courters of the variance of achievements in geometry. And in generally, it has been found that the classroom's climate indicators, self-efficacy of learning and positions toward geometry, succeed to predict geometric efficacy and to explain almost two thirds of the variance of geometric efficacy. It has been found that the positions toward geometry variable is the most significant indicator for predicting geometric efficacy, and that the self-efficacy of learning variable is also a distinct indicator for geometric efficacy.

General classroom's climate, self-efficacy of learning and the positions toward geometry, predict achievements in geometry and manage to explain more than two third of the variance of achievements in geometry. It has been found than the positions toward geometry is the most significant indicator for achievements in geometry, and that self-efficacy of learning is a distinct indicator for achievements in geometry.

Already in the year of 1982, Robert [28] explored and examined the correlation between achievements in geometry and the positions towards it, and he has found a difference between dominant and non-dominant students. The non-dominant students disliked geometry while the dominant and better students were sympathetic and patient towards it. Zedan [18] as well, found that students with high academic achievements, perceive the classroom's climate as supportive, warm and more fulfilling than non-dominant students. Fraser and Tobin [32] as well, found that it is possible to explain the differences in academic achievements by the classroom's climate factors. Further studies [29] testify on distinct positive correlations between classroom climate and academic achievements.

It was also found, that there is a clear connection between every one of the classroom's climate factors and achievements in mathematics. It has been proven, that in more cohesive classes, high academic achievements were measured, as well as a high measure of fulfillment and enjoyment, and less conflicts [49].

In the study of Martin-Reynolds & Reynolds [50], it has been found that there is a highly positive connection between the perception of classroom atmosphere and the level of academic achievements. Classes where; involvement, teacher's support, clear regulations and behavior rules, were observed, were the classes with the highest achievements. Similar findings were also found in the classes that tend innovative teaching methods. So that the cheering and supportive atmosphere makes the student to feel safe, though without support and humane treatment, the student feels lonely, worthless, and do not reach to his or her full potential and skills [51].

Students with high academic achievements perceive the climate as more positive and express more involvement (Gordon, 1998), so it is very important for the classroom's climate to be encouraging, warm and supportive in order for the students will be able to learn from their mistakes, and would not be ashamed of having mistakes and to ask questions. A supportive atmosphere in the classroom increases the achievements.

The findings in Zedan research [35] reinforce as well, the assumption that there is a positive connection between classroom climate and the students' academic achievements. Linear and his colleagues [52], in a thorough review of the literature, emphasizing the positive relationship between students' social skills and academic success, and academic achievements. There is also the links between social and emotional atmosphere in the classroom and school achievement [53].

In a recommendation for improving and raising the school achievements Broussard and

Garrison [53] claim that a constructive studies atmosphere can be so important, that the priorities should change drastically, meaning, in order to promote the school achievements treatment for improving the climate should be moved to the top of the priorities.

Further studies have found [54] that a positive classroom's climate increases the students' self-esteem and self-efficacy, and advances their school performances. It was also found that social learning environment is the basis for the development and to the molding of the learners' self-image, personality and their social and academic function [1].

Patrick, Ryan & Kaplan [55] have found that there is a significant positive connection between the level of motivation and self-efficacy and the students' attitudes in comparison to their perception of the classroom climate, Nichols & Zhang [56] found as well, that the positive classroom climate increases the students' motivation, and produces a positive and emotional experience among the students, while reducing stress and tension during the studies, which might improve the cognitive learning skills.

Bloom [25] has found that it is possible to explain a quarter of the variance in students' achievements by their emotional characteristics that are expressed in self-efficacy, or attitudes toward a particular subject and educational atmosphere, which prevails during the specific lesson.

5. SUMMARY OF CONCLUSIONS AND SUGGESTIONS / RECOMMENDATIONS

This study examines these parameters: The personality; self-efficacy of learning geometry. The emotional parameters; positions toward geometry as well as classroom's climate during geometry lesson. The cognitive parameter; geometric efficacy, and the academic parameter; academic achievements in geometry among Teaching students in Arab collages for training teachers in Israel, as a function of experimenting in learning environments: the first- traditional, the second- High-Tech learning surrounding, supported by computerization and telecommunication.

The findings of this research point out that; students who have learned geometry frontally reported on having more fun, enjoyment and content in learning geometry than students who have learned by computer-integrated method-telecommunication course. Students who have learned computer-integrated geometry course, reported on having more clarity and observance of rules and guidelines from the teacher than the students who were taught geometry frontally. The students in frontal learning group reported on having more support and encouragement from the teacher than students who have learned with a computer. It was also found that, the students who learned with a computer reported more on experiencing a discriminative treatment-based on gender or achievements from the teacher, than students who learned frontally. Generally, the students who have learnt frontally, reported on a more positive perception of the general classroom's climate than students who have learnt geometry with a computer.

It was also found that students who were taught geometry with a computer were found as having a higher self-efficacy of learning with a computer than students of frontal learning groups. In addition, the perception of the dimension of learning within a team, among students who have learned with a computer, was found higher than students from the control group- who have learned frontally. Another finding is that self-efficacy of learning among students from the experimental group- who were taught by a computer, was higher than among students from the control group- after the course.

The students' position toward geometry who were taught frontally is more positive than the attitude of the students who were taught by a computer, who have a more negative attitude toward geometry than the attitude of the students who learnt frontally.

As for the geometric self-efficacy, it was found that students who have learnt frontally have a higher geometric self-efficacy than students who were taught by a computer.

An additional finding is that the students who have learnt frontally have higher achievements in geometry than those who have learnt with a computer.

Additionally, it was found that, the perception of the dimension of fun, enjoyment and content among the group of students who learned geometry with a computer decreased by the end of the course, though while the dimension of the teacher's rules and guidelines increased, the dimension of support and encouragement from the teacher decreased, as well as the perception of the general classroom's climate which became less positive after the course began. The position of the students who have learned geometry with a computer toward geometry, decreased along with finishing the course.

It has been found that the dimensions of the classroom's climate as well as the dimensions of general self-efficacy of learning, succeed to predict geometric efficacy. And that a positive attitude towards geometry, learning ability, figuring a solution and self-confidence, along with learning within a team, are clear and significant indicators for geometric efficacy. It was also found that the dimensions of classroom's atmosphere and self-efficacy of learning dimensions and the positions toward geometry dimensions succeed to predict achievements in geometry. It was also found that, geometric efficacy predicts achievements in geometry as well.

In light of the findings received by this research, we raise recommendations that reply to the question that occupy us as well as many teachers' instructors; How to train students to use technology in teaching in generally and in teaching science and geometry particularly?

- By enlarging the number of courses that require the combination of Computing and Telecommunication, in all fields and expertise in all departments and routes.
- There should be a computer-integration in training Teaching students, to expand horizontally and vertically, meaning, to design multi-year courses, for the instruction of the various disciplines, rather than just literacy and computer applications.
- Appropriate software and courseware should be obtained.
- There should be a computer-integration into pedagogical training and practical experience, by increasing the demand of the students to design and implement lessons plans that integrate computing and Telecommunication.
- A mandatory course should be dedicated for the usage of smart-board in class in teaching all subjects.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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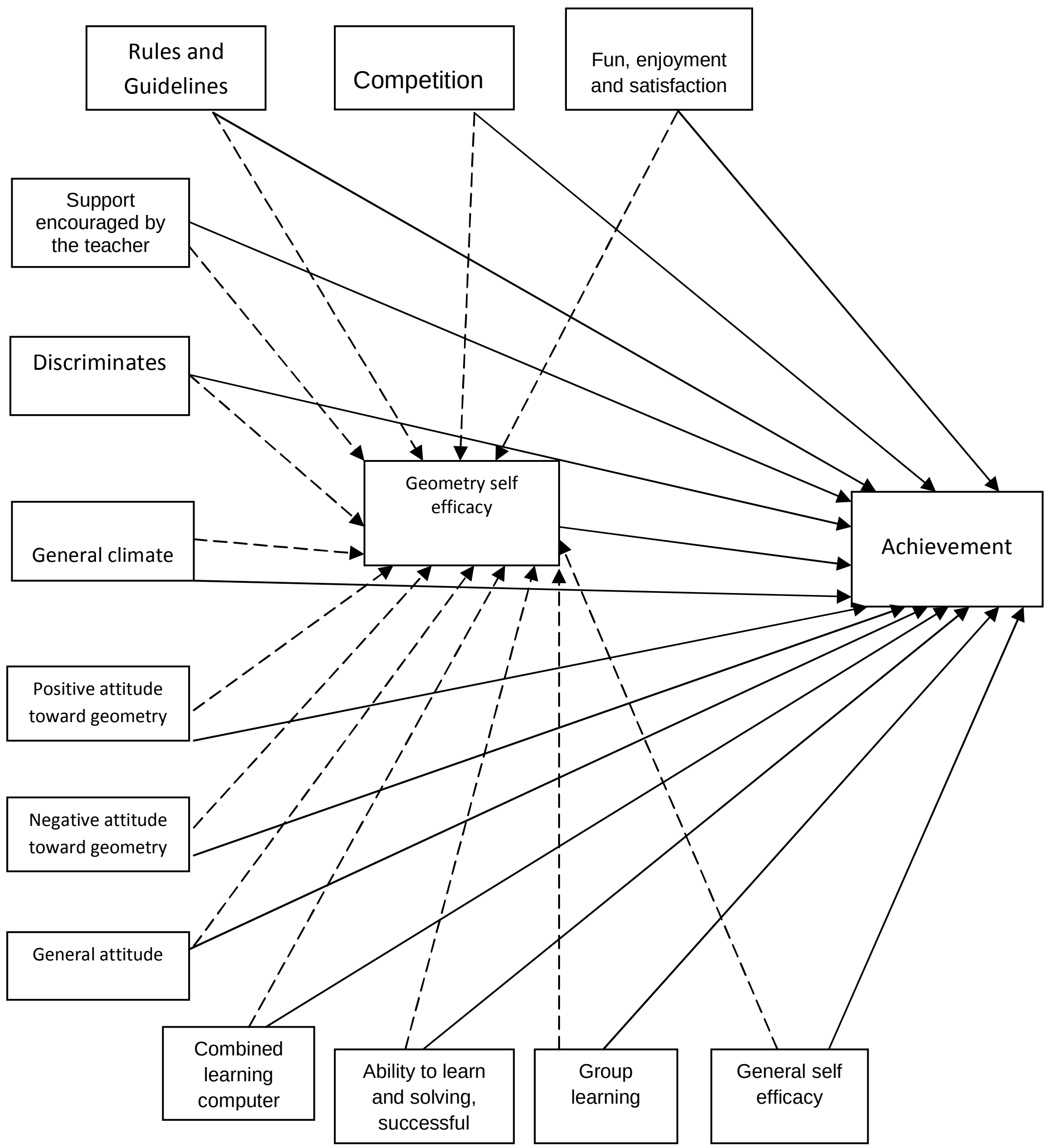
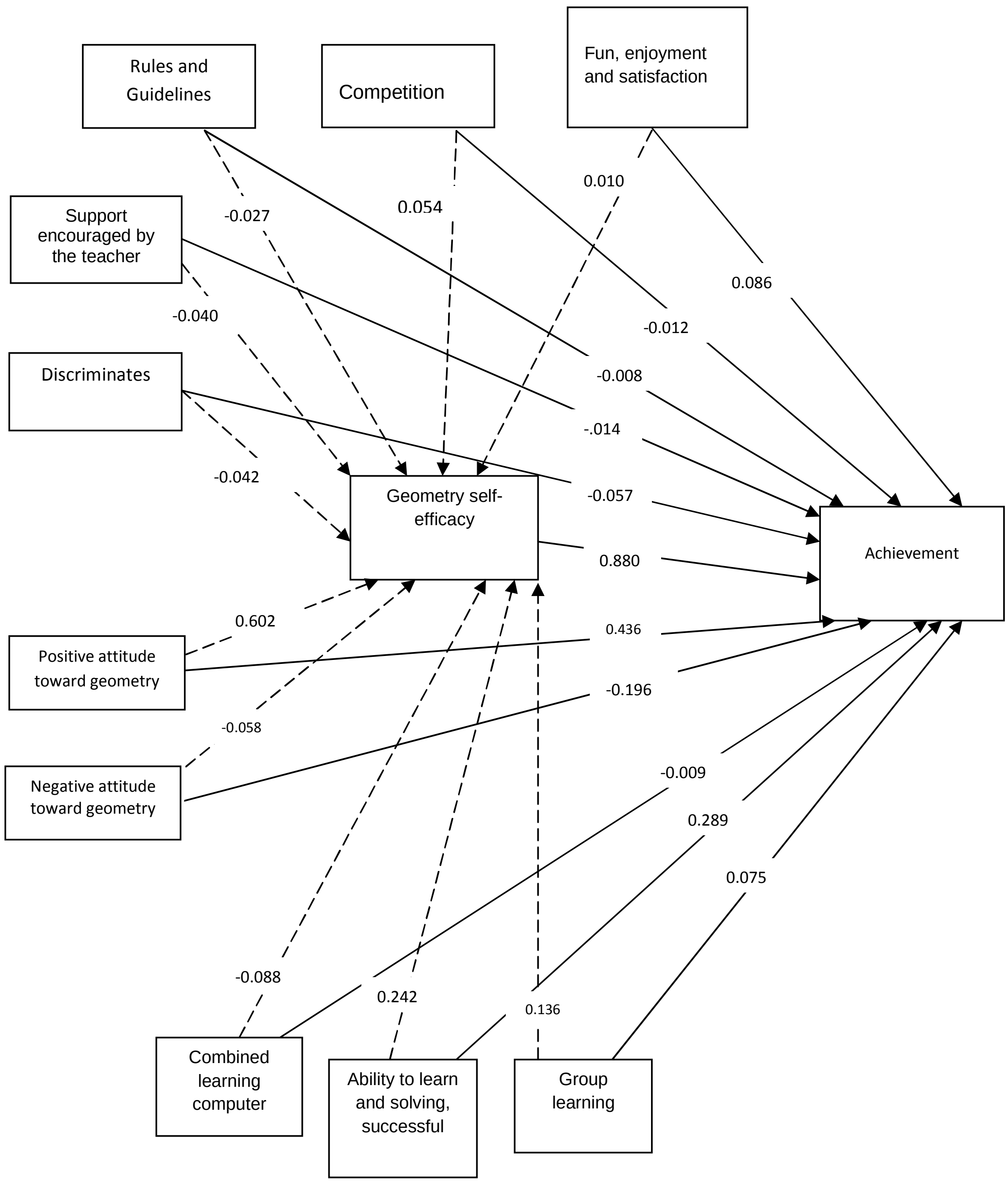
APPENDIXES

Appendix A



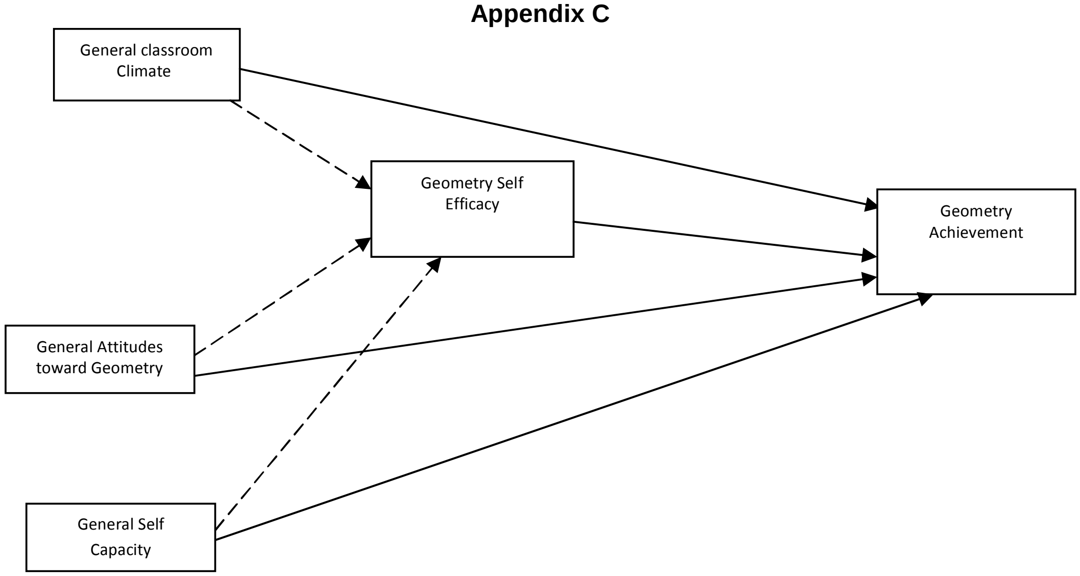
Model No. 1

Appendix B



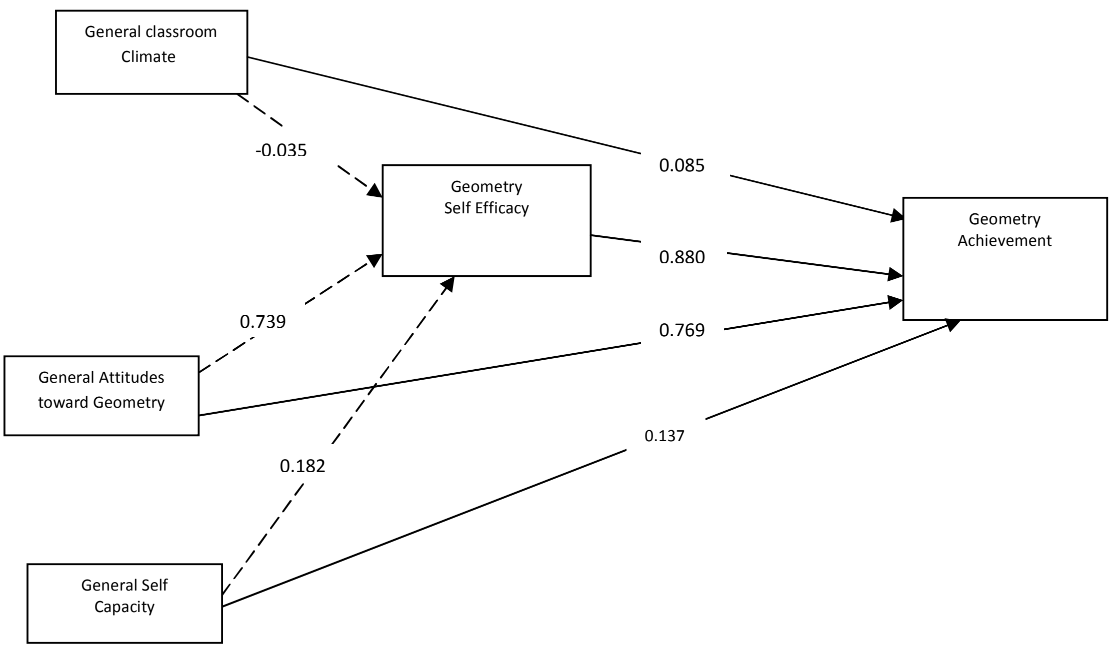
Model No. 2

Appendix C



Model No. 3

Appendix D



Model No. 4

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