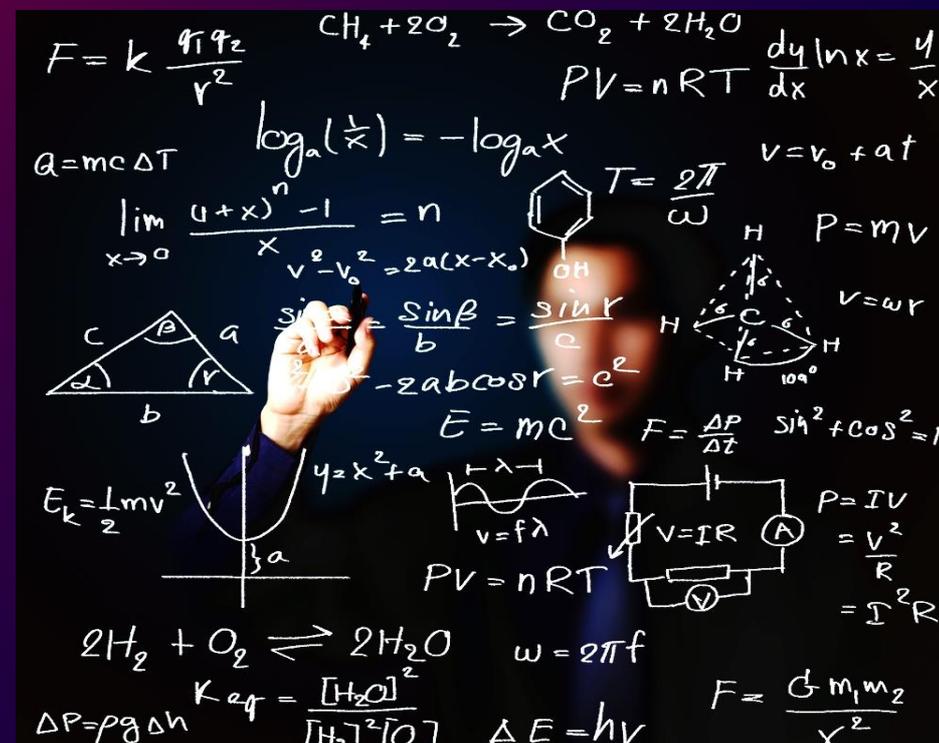


THE IMPACT OF CULTURAL IDENTITY AND THE PERCEPTION OF THE TEACHING PROFESSION, ON THE PERCEPTION OF A GOOD TEACHER'S QUALITIES AMONG MATHEMATIC TEACHERS

AND THE EFFECT OF THE USAGE OF ORIGAMI ON THE PERCEPTION OF THE AREA OF QUADRANGULAR SHAPES IN THE ISRAELI ARAB SOCIETY

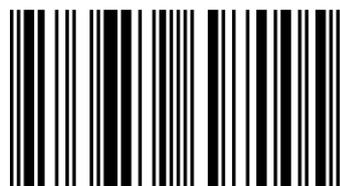
Excerpts on mathematics education in the Arab community in Israel



This work is written by Dr. Wafiq Ali Hibi. A researcher in the field of pure mathematics, he completed his doctoral studies in the Department of Pure Mathematics, University of Haifa, in 2004, after solving a mathematical problem in the topology of metric spaces and graphical theories in isometric spaces, which was open for nearly fifty years.

Dr. Wafiq Ali Hibi

Excerpts on mathematics education in the Arab community in Israel



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Dr. Wafiq Ali Hibi

Caddo Gap Press, USA

**Excerpts on mathematics
education in the Arab community
in Israel**

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Dr. Wafiq Ali Hibi

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This book contains two experimental studies in mathematics education, conducted in the Arab society in Israel.

The first checked: Is there an influence of the cultural identity of the teacher on the perception of the good teacher qualities, among math teachers of the Arab society? Is there an influence of the teaching profession perception, on the perception of the good teacher qualities, among math teachers of the Arab society?

The second checked: To find out to what measure the origami method affects the perception of quadrangular shapes “area” among 8th grade pupils in schools of the Arabic sector in Israel.

Dedication to my sons and to every student and researcher.

**THE IMPACT OF CULTURAL IDENTITY AND THE PERCEPTION OF THE
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QUALITIES AMONG MATHEMATIC TEACHERS IN THE ISRAELI ARAB SOCIETY**

Abstract	7
Introduction	8
Arab cultural Identity.....	17
The study's aims and objectives.....	26
Method of data analysis.....	31
Finding	32
Discussion	38
Research limitations.....	44
Attachment.....	46

**THE EFFECT OF THE USAGE OF ORIGAMI ON THE PERCEPTION OF THE AREA
OF QUADRANGULAR SHAPES**

Abstract	61
Introduction	62
Theoretical Background	63
Methodology.....	74
Finding	76
Discussion	83
Research limitations.....	85
Attachment.....	86

THE IMPACT OF CULTURAL IDENTITY AND THE PERCEPTION OF THE TEACHING PROFESSION, ON THE PERCEPTION OF A GOOD TEACHER'S QUALITIES AMONG MATHEMATIC TEACHERS IN THE ISRAELI ARAB SOCIETY

Abstract

The issue examined in this study is the connection between cultural identity and the perception of the teaching profession and the perception of the good teacher among mathematic teachers of the Arabic sector in Israel. The theoretical framework indicated that the culture affects the perception of a good teacher, thus, there are linguist and cultural differences between Jews and Arabs regarding the good teacher perception. Math teachers are obliged to conventional teaching methods and learning program of Arabic education, which are no longer connected to the social and cultural changes occurring in the Israeli Arabic society. This is why the schools direct their educational endeavors to scholastic achievements and focus on visible short-term outcomes, such as imparting knowledge and developing instrumental skills more than educating for values and identity.

The research conjectures are:

It will be found that:

- a). There is a connection between the teachers' cultural identity and his/her perception of the good teacher qualities,
- b). There is a connection between the teaching profession and the good teacher's perception,
- c). The cultural identity and the teaching profession affect the good teacher's perception among primary schools' mathematic teachers of the Israeli Arab society.

The study had been conducted in a quantitative approach, and the main research tool was a four-parts questionnaire: 1 – General background; 2 – Cultural identity; 3 – perception of the teaching profession; 4 – The qualities characterizing the successful teacher.

The research was a convenient sample that included 123 teachers. The main research findings revealed that collectivism and positive perception regarding gender roles inequality relates to the

good teacher perception. Teachers with positive attitude toward Math teaching that perceive teaching as a mission, are characterized by high level of a good teacher's qualities. The stance towards a collectivist society, the perception of the future teaching profession and position regarding roles and gender contribute to the prediction of the qualities of the good teacher. The research conclusions show that a good teacher contributes to the importance of teaching mathematics within the cultural context.

A good teacher has to choose the profession with a sense of mission and passion for Math and preserve these feelings throughout the years of teaching the profession. There is a need to incorporate Academic training in Math, and College Math teaching training, by placing high challenges in the training of Math teachers that will bring the system the appreciation of the Math teaching profession and the culture independent teaching that will lead to good teachers' development.

Introduction

Reflections on the image of the "good teacher" are not a new phenomenon. The extensive engagement with the subject develops and remains relevant, since the perception of "the good teacher" is culture and context dependent, and therefore, it is not scientific but evaluative, that changes with time and circumstances.

Modern educational philosophies argue that in order to achieve a better compatibility to the new reality, characterized by the technological revolution, expansion of globalization, social changes and undermining the status of knowledge, there is a need to promote self-assessment of the individual [Levi-Feldman, 2020 p.52].

The main pedagogic challenge faced by the educational system in the post-modern era is development of self-management and problem solving capabilities [especially problems relating to the complexed changing world], and to focus on imparting skills and abilities such as: creativity, innovativeness, conceptualization, communication cooperation, information literacy, technological skills and critical thinking. According to this perception, the requirements the teachers must nurture in the post-modern era should be also reflected in the quality of the teachers' skills and capabilities.

Thus, the role of the mentoring teacher is to instruct and guide the students during the process of their personal and professional development by means of providing the conditions, tools and skills required for the best, sophisticated and independent self-management, who are expected to work in a multi-cultural constantly changing world, both as individuals and as part of a group. This is the main role of the teachers, and by so doing, mentoring teachers must adopt themselves to various learners and realize that the tools they introduce to them will serve them not only during their school time, but also during their life as adults [learning throughout life]. The teacher has to think more about the process and less about the content, to look beyond the fields of study and recognize that knowing how to learn is a basic skill for learners.

Focusing on the perception of the good teacher according to the post-modern approach, the mode, the teaching profession is perceived and the impact of various factors on the perception of the good teachers' qualities in the professional literature is insufficient. The aim of this study is to look into the matter, to examine the impact of the cultural identity and the perception of the teaching profession, on the perception of the good teacher qualities. Regarding the impact of cultural identity, the professional literature contains a number of comparative studies, between teachers from the Jewish and Arabic sectors. Therefore, the emphasis of this study will be on the cultural influence on the perception of the qualities of the good teacher in Arab society., since very few studies examined the influence of the teaching profession perception, on the perception of the good teacher qualities in the Arab society.

1. Literary Review

Traditional educational perceptions focused in culture or social needs hold that the role of the teacher is to shape the pupils in the spirit of the culture and expose them to the principles of science, moral, civics and art. Therefore, the teacher must be a wise well informed person, who is also an intellectual, scholar and knowledgeable. He/she should portray an example of good and civilized person. These perceptions also assume that a person possessing all these qualities can also teach. The focus in these perceptions is the society [community]. The teacher must know the values of the society he lives in, and be an expert in its structure and institutions. The content worthy of the functioning of the individual in society is dictated from above and the teacher is not required to make a judgment regarding what he/she is required to teach. He/she is expected

to know the learning program to possess basic knowledge of the content, to know the best ways to impart the contents of important subjects, and to possess pedagogic skills that will enable him/her to improve and better the teaching and learning effectiveness. Thus, his/her main job is focused in teaching products, especially those required for high education and proper social functioning. [Aloni, 2005].

The more innovative perception holds that the teacher is there to help the pupil to realize his/her potential. Self-realization of a student also involves the self-realization of the teacher as part of a community [Aloni, 2005]. Expectations of a teacher include commitment to the teaching profession, ethical commitment, practical teaching ability, addressing the differences between students, ability to adopt the contents to the learners, environment time and place, assessment ability, responsibility and personal commitment to professional growth, problem solving and judgement abilities. [Levi-Feldman, 2010].

In recent decades evolved 3 perceptions regarding the definition of a good teacher: the educated teacher, the professional teacher and the values teacher. The educated teacher has verbal skills and expansive education, which he/she utilizes as culture and world knowledge agent; the professional teacher had vast educational knowledge, expertizes in teaching and learning processes and the subject he/she teaches; the values teacher has empathy and commitment to his students. He/she perceives his students as possessing intellectual and emotional skills, and himself as a person fulfilling a valuable mission [Arnon & Reichel, 2009].

Research on this issue is based on three central axes: The first axis is the value-ideological axis, describing teachers that differ from each other regarding the aspects emphasized in their work: a teacher who instills culture, a teacher as an agent social change or preservation, a teacher who emphasizes on development of the individual, and a teacher who instills disciplinary knowledge. The first three are based on the supreme educational ideologies, defining a good or desirable graduate; they speak of teaching patterns of imitation, shaping and development or acculturation, socialization and individuation, whose aim is to lead to good learning [Lam as cited in Newman, 2016]. According to the sociological ideology, a good teacher is a person who has an authoritative personality, he/she can hold a class, his/her teaching is systematic based on organization of the materials into defined tasks, clear demonstration of the way to handle and exercise these tasks. According to the acculturation ideology, a good teacher represents by

his/her behavior, the values of the preferred culture from which he/she draws his/her authority and his/her ability to keep class. His/her teaching is based on organizing the materials around great ideas and presenting them in a captivating and stimulating way, to create interest, involvement and identification. According to the individuation ideology, a good teacher has an emphatic supportive personality; in his/her teaching, he/she “flows” with the pupils and tries to discover the subjects that will interest them. thus, since there is no one definition to the good teacher but three, as specified above, a good teacher will aspire to fit the pupils to the ideology he/she believes in, and to the resulting teaching pattern [Harpaz, 2010].

The second axis is the teacher’s personality characteristics, claiming that the teacher’s personality traits should be sorted in order to recognize those characterizing a good teacher, such as: intelligence, intellectual ability, resourcefulness, creativity, emotional maturity, patience, fairness, motivation, cooperation responsibility and reliability that influence his/her teaching. [Reichel, 2010].

According to Newman, [2016], different perceptions of the good teacher’s personality are used for teachers’ evaluation and supporting their professional development. Following Are his definitions regarding different types of a good teacher:

- **The ideal teacher** is perceived as an independent creative person, possessing professional approach and ability to understand his/her pupils and involve them, a teacher should be of good nature and mental stability. A charismatic assertive and ethical person, who also has good planning control & managerial skills.
- **The analytical teacher** performs systematic follow-up by diverse observations, after everything that occurs in his/her class. This type of teacher is inclined to constantly study his/her functioning; he/she checks his/her own records and does his/her best to constantly improve.
- **The effective teacher** – has a decisive influence on the achievements of his/her students; the teacher who successfully leads his students to academic achievements regardless of his/her teaching method. Effective teachers are clear, leading and supporting, they supervise everything that happens in class. They are fair and constantly continue to challenge and motivate the pupils.

- **The responsible teacher** – focuses on fulfilling tasks within his/her, areas of responsibility. He/she knows well the subjects he/she has to teach, and performs his/her role with a sense of mission, and has good managerial skills. As long as his/her teaching method is suitable to his/her students, its mode is of no importance.
- **The trained teacher** - knows how to plan a lesson, apply teaching, evaluate students, communicate and perform administrative tasks, and above all, he/she can guide the student during his/her learning process placing an emphasis on the relationship rather than knowledge.
- **The expert teacher** – has vast comprehensive knowledge in his/her field. The knowledge is well organized and accessible to teaching. He/she is highly effective and able to accomplish more than other good teachers in shorter time. He/she is able to reach suitable and original solutions to problems. His/her teaching emphasizes imparting of knowledge to the student. His/her knowledge enables him/her to change the curricula, develop specific selected tasks, explain the learning material in a higher level and recognize students' misunderstandings.
- **The liked teacher** – is a teacher who conveys what is expected of him in pleasant ways and is attentive to the needs of the students. A teacher that everyone, students, parents, colleagues and principals employing him/her, are happy with him/her.
- **The responding teacher** – recognizes and responds to differences among his/her students, considers the various needs of his/her students a factor affecting his/her teaching. He/she is sensitive to cultural, economic, intellectual and to different mental and emotional background, diversity among his/her students. He/she is tolerant and sensitive, demonstrates empathy and dedicates time to improve the life of his/her students in class and outside the school.
- **The appreciated teacher** – is an honest fair devoted and empathic person, with concern for others. If need be, he can be determinative and will willing to deal with serious obstacles to insure the success of his/her students.

From all the above listed traits characterizing the good teacher the outstanding personality traits essential for the good teacher are: Dynamism Creativity Organizing Ability Warmth and Patience.

The third axis is the area of the teacher's knowledge. The knowledge types a teacher needs to teach include: knowledge of the disciplinary area, general pedagogic knowledge, including class management, curricular knowledge relating to the learning program and mastering of the teaching tools, pedagogic knowledge of the content connecting the teaching subject matter and pedagogy, knowledge about the learners and their characteristics, and knowledge about the educational context including information about the class, the school and the community, alongside knowledge of the educational aims and values, and their historical and philosophical background. [Reichel, 2010].

The good teacher has to promote achievements, make knowledge applicable, possess professional personal skills suitable for class management. He/she should also be ethical and highly motivated. A good teacher should be knowledgeable regarding the field of knowledge that is scientific at its core, organized according to principles and can be applied, perceive him/herself as providing a unique service to the public/community. He/she ought to be autonomous, with the ability to choose between the different profiles of the good teacher. His/her principles and educational approach should be guided by his/her own educational perception, he/she should feel personal responsibility not only for his/her work and the accomplishments of his/her students, but also for their wellbeing, their development and the joy of their learning, acting according to a high degree self-control code of conduct, together with strict adherence to professional ethics. He/she should be a member of a professional organization to strengthen the professionalism of him/herself and his/her colleagues. [Newman, 2016].

On 2010 the **RAMAH** [the Hebrew acronym for: The **N**ational **A**ssessment and **E**valuation Authority for **E**ducation] in Israel, developed a specified detailed tool for teachers' assessment that will enable factors within the educational system to arrive at an agreement regarding the measures of success required from a good teacher. The tool connects the teacher's knowledge, the way he/she teaches and his/her background variables. It is based on four measures of the teacher's success:

- a. **Role perception and professional ethics:** includes components that deals with the teacher's identification with the teaching and educating role, and his/her commitment to the organization and the system.

- b. **The field of knowledge:** includes components that deal with the teacher's control of the field of knowledge the knowledge he/she possess for teaching the field of knowledge and his/her generic pedagogic knowledge.
- c. **Educational processes:** including components that deal with the way the teacher conducts and organizes the lesson, the teaching methods, his/her learning and evaluation, and his/her ability to create a learning supporting environment.
- d. **Partnership in a professional community:** includes components dealing with the teacher's involvement with the school's professional community and with the professional community of the field of knowledge. [Belser, Hartaf & Ratner-Avrahami, 2011].

In the state of Israel, the identity ethno-cultural components are more dominant in explaining the differences in the view of the good teacher: the study's Arab participants had presented a similar clear and consolidated perception of the good teacher's qualities, while the Jewish participants presented a much more heterogeneous perception of the good teacher's qualities. The findings also reveal that the participants of the Arabic sector perceived the teacher being a person of values and ethics as the most important feature, of the good teacher, while participants of the Jewish sectors attributed more importance to the quality of the teacher's teacher-pupil interaction. Thus, in Israel, culture does affect the perception of the good teacher. [Newman, 2016].

The main difference between Jewish and Arab students are reflected in the teacher's inter-personal relations: the role of the teacher and guide and mentor, in a teacher-focused style, versus a student-focused style, and the feelings of the students towards the teachers. [Katzir, Ezer, & Shalom, 2007].

The perception of the Arab teacher in the Israeli Arab society, was affected by the unique development of the Arab education in Israel as education of a national cultural and religious minority. The social-cultural & political context Arab teachers in Israel are working in, explains the way perceptions regarding the good teacher evolve. [Arnon & Reichel, 2009].

It started during the era of the British mandate, whose authorized representatives, along with the Christian churches, supervised all Arabic schools. During the war for independence, and with the establishment of the State of Israel, many Arab intellectuals left the country. At the very first

year of the State of Israel existence the law of compulsory education was legislated, and its implementation caused a huge increase in the number of Arab pupils, especially in regard to girls' pupils. With no stock of teachers, the young state placed high-school graduates in several teaching positions, a move that caused the use of traditional teaching methods in Arab society which slowed down development in terms of disciplinary and pedagogic knowledge. Only in the 70ies of the 20th century, a committee was established to address processes of change in the Arab education system in Israel. Then the construction of study programs for Arab schools began with the participation of the teachers, this encouraged discourse on topics that had not been discussed until then.

Since the 90ies of the 20th century, the ministry of education directed significant resources to reduce the gap between Schools in the Jewish sector and schools in the Arabic sector, while changing social trends in the Israeli Arab society, increased the Arab public's expectations that their children will obtain higher academic achievements that will enable many of them to receive a matriculation certificate and integrate into institutions of higher education but with the observance of the traditional-cultural codes. The perception was that the teachers should be social agents, updated in both western and Arabic cultures. [Fogel-Bijawi & Becher, 2003].

A survey conducted on 2010, among female students attending a teachers' college regarding their perception of the concept "the good teacher" and the connection between their perception and their position towards the three major components of the Arabic culture, which are: collective society, religion and gender equality, revealed that in their view, a good teacher is the teacher the creates and maintains comfortable atmosphere in class, a professional who knows his materials well and able to impart the required knowledge to his/her students. He/she should be able to develop the students' cognitive ability and conduct open, symmetric communication with his/her students. The survey participants emphasized the importance of the personal skills and expertizes skills of the good teacher, together with traits relating to having good communication with his/her students and the ability to develop their cognitive abilities mastering the knowledge and constantly update it. the good teacher keep the class disciplined and evaluates his/her pupils' achievements correctly. Religious Arab students perceived the teacher mainly as a source for knowledge, who facilitates an adequate learning process. The more religious the participants were, the less importance they attributed to traits related to classic updated teaching. Female

students who preferred the gender equality approach had been more inclined to prefer the modern approach perceiving the teacher not only as a source of knowledge, but also as an educator developing the pupil's personality. And emphasized traits expressing the professional work of the teacher at the student level. [Awad, Zuabi & Halil, 2010].

According to the traditional approach, the identity of the beginning teacher is formed by experiences, stresses and crises that are being resolved over the years, until it reaches stability. According to the modern approach, there is no one professional identity, but a pragmatic hybrid identity, which is constantly changing due to experiences in diverse and contradicting events, and encounters with significant others.

Thus, a teacher can have a number of professional identities that develop over the years, upgrade, get more complexed and do not unify into one identity and consolidate. Another important factor affecting the professional identity is the culture and environment of the individual. [Beijaard, Meijer & Verloop, inside: Cohen-Azaria, 2020].

The professional identity of a teacher is combined of two parts:

- 1). Perception of the professional-self including: self-image, role motivation, role perception and satisfaction factors. This is the professional component referring to the quality of the performance.

- 2). Personal educational theory – combined of beliefs and opinions providing meaning to the perceptions and expectations of the teacher. This is the personal component referring to the personal attributes of the teacher; teachers build their professional perception by combining their perception of their expertise in the knowledge subject they teach, pedagogy and didactics. [Beijaard, Meijer & Verloop, inside: Cohen-Azaria, 2020]. Therefore, the perception of the good teacher is value-based and depends on the historical, cultural and ideological context of society.

Arab cultural Identity

The identity of the Arabs living in Israel is combined of two main components: the civil component deriving from the very fact of being Israeli citizens, and the national component which is a consequence of their national affiliation to the Arabic nation at large, and to the Arabic Palestinian nation. Although most Arab citizens of Israel have difficulties to identify with the state and its Jewish symbols, the majority of the Israeli Arabs are satisfied from their civil status and life conditions in general, and wage their social and political struggles to improve their status and promote their rights as citizens of the state, in democratic tools. The issue of the national Israeli-Arab conflict, is always there, but as a secondary issue that in most cases is summed up by expressing identification with their brethren. A poll, conducted on 2015 revealed a rise in the amount of Arabs in Israel that identify with the flag of the state of Israel and decrease in the number of those identifying with the Palestinian flag. This finding is consistent and was found even among Muslim Arabs. [Lavy, 2016]. However, the Arabic culture which is the dominant culture of all Arabic speaking people in Israel, including non-Muslim Arabs, and certain non-Arab minorities. The Arabic culture is a traditional culture, created by conditions formed by a system of values, affected and is still influenced by environmental factors, historical circumstances, past customary life styles, exposure and interactions with others. Culture is reflected by language, literature, legends, music and other art forms, alongside various traditional conventions, like social structure, fashion, custom, customs and sometimes even world view.

The above mentioned factors lead to social values such as: collective mutual dependency, harmony, hierarchy, maintaining the good name, commitment to the members of the immediate and extended family, partnership, modesty, restraint, moderation, and providing for needs of others even at the expense of the personal needs of the individual. This culture emphasizes the identification between the aims of the individual and the aims of the collective, and gives priority to the aims of the collective. Membership in a collective lasts for long time and characterizes with involvement, strong emotional closeness, and emphasizes obedience and conformity, alongside cooperation based on concern regarding the needs of the other. On the other hand, the attitude towards people outside the group, can be suspicious and hostile. [Geraisi, 2012].

A central social value of the Arabic culture is sacrifice. The parents try to instill this value to their children by personal example and encourage them to sacrifice for the benefit of other

relatives. In addition, the Arab society requires its members to possess self-discipline and self-control. Emotional control, composure, patience, self-control and the ability not to loudly protest in times of distress, are required to adequately cope with painful and oppressive moments in life. [Haj Yihye, 2006].

In the majority of the Arab society, free will of the individual is not perceived as a supreme value, since most people still hold the faith that the Lord/ Alla, is the main factor controlling a human fate. The personality structure is tuned to perceive that the main source of anxiety is external, like shame of punishment rather than internal like a sense of guilt, and the main source of happiness is also external, like social status and social appreciation rather than internal deriving of self- realization. Avoiding shame and punishment requires social coping skills rather than psychological defense mechanisms. The Arabic culture offers 4 coping mechanisms the individual can use to maintain balance with society as well as family and social harmony:

- a. **Mus'ira** – a life style in which the individual adjusts him/herself to the expectations of others, while hiding his/her true feelings and thoughts in order to avoid possible embarrassment.
- b. **Istijava** - a mechanism allowing the individual to express feelings and thoughts that had been repressed by the **Mus'ira** mechanism.
- c. **Pahloya** – a combination of **Musira** and **Istijava**, used to advance personal matters without provoking the social system.
- d. **Identification with the oppressor** – the tendency of a suffering individual to justify norms and values of oppression by identifying with the oppressor. [Dviri, 2006].
- e.

The connection between the qualities of the good teacher and the teacher's cultural identity

In most modern cultures, there is a yearning for an ideal teacher, human and attentive. This yearning is a product of an era characterizes by individualism and inattention. In the view of the students in the academe, a good teacher has to be “a Man”, human, fair, relaxed, wa person with values and well versed in the subjects of study. He/she does not need to reflect aspiration for broad cultural horizons, social change or valuable critical discussion [Reichel & Arnon, 2005]. Comparison revealed that there are no differences in the way the good teacher is perceived in diverse cultures. The good teacher is everywhere perceived as a person that should

advance/promote achievements, make knowledge applicable, and possess personal and professional skills suitable to manage class, and be ethical and highly motivated. In other words, he/she must be effective, expert, able, appreciated and responsible [Strong, 2009].

Math teaching: perception of the profession

There are 4 groups of the main factors that together determine the professional choice of a person. These factors are found in the interaction of the individual with others but each of them has its own place.

- 1) Practical considerations: based on two variables: the salary earned in the profession with the possibilities of promotion that may benefit it in time and the chances of employment.
- 2) Social positioning - the status of the profession in the hierarchy of professions that are considered prestigious and/or of importance to society and the contexts it is referred to in the media.
- 3) Work conditions including: work environment, level of difficulty, and the measures of challenge, interest and diversity.
- 4) Personal tendency, expected rewards and incentives as part of the job, like personal attraction to the profession due to its importance to the individual, regarding providing a sense of self-expression and the ability to make a difference, correlation with the individual values and to what extent the abilities, talents and traits of the individual correspond to the profession and working conditions in it. [Dahaf institute, 2012].

Regarding the image of the Math teaching profession, practically, the choice is not attractive, although the chances for employment and job security are high, the salary is barely average, there is no advancement, and socially, the profession image is low since there are other alternatives in the jobs market, as it is generally considered as a profession of people that had no other choice and no ambition. The exposure of the profession in the media is scares, while work conditions and working environment are unattractive; the class resembles a battlefield, aggressive parents are often humiliating end the work is not easy and continues at home. Although the profession has some convenient aspects, beside the job security and guaranteed future benefits, teachers have short working hours and many days of vacation. There is also the

school's teachers room providing a measure of social support, but they do not match the hard work required from a Math teacher. [Dahaf institute, 2012].

Regardless of the above, the teacher is a key personality in the pupils' academic and emotional progress. This is true to all academic subjects but even more so in Mathematic. The professional functioning and success of the Math teacher relays not only on professional, didactic-pedagogic and curricular knowledge, but also on the professional self-image and his/her confidence in his/her abilities. A Math teacher believes in him/herself and his/her ability to possess the required skills to impart his/her knowledge to his/her pupils and his/her ability to advance the pupils' achievements, together with the professional aspect of mastering the knowledge of lesson planning and execution and correcting the performance of the students. [Vider, 2018].

Therefore, the only aspect supporting the professional choice of teaching Math is the personal inclination. In a sense, teaching Math is better than teaching other subjects because it can be rewarded by a relative more sense of meaning, influence and even contribution to society, if indeed the teacher perceives him/herself as possessing the skills and abilities required for this profession [Dahaf institute, 2012]. Students in teachers' colleges, training to become Math teachers also testify that the main considerations that led them to choose training for the profession are the interest in mathematics, the love of the subject, and the challenges in teaching it. [Arnon, Frenckle & Robin, 2012].

Another issue Math teachers is required to cope with, that could negatively affect his/her perception of Math teaching, refers to the demand of the ministry of education to incorporate effectively computerized teaching and illustrative aids in their teaching. The teacher's perception of his/her conduct in an environment equipped with technological teaching aids, to permanently adopt the use of technology, affects the perception of Math teaching in school. [Vider, 2018].

The connection between the good teacher qualities and the perception of the teaching profession in general and Math teaching in particular.

The traditional educational perception the Israeli educational system is based on, maintains that the better the teachers are educated, the better teachers they are. Teachers are required to have a formal academic education and continue to study [life training]. This perception positions culture

in its center, maintaining that the main objective of education is to anchor the individual in the historical partnership of the human race whose product is civilization. Therefore, an educated person who has values and stable stance in a culture that exists for many generations, proving that they are important and essential to Man and to the human society. An educated man of values is intellectual with positive personality. Teaching is meant to shape the pupils' personality and educate them to be good civilized people. The teaching methods should deal with shaping humans in the spirit of the dominating culture [Lam, inside Levy-Feldman, 2020].

The modern perception maintains that the objective of education is to provide the pupils the conditions for personal development and self-realization, regardless of culture or social goal, since the truth resides within the pupils themselves, but they need the teacher to guide them and encourage them to find their own internal truth, to develop their personality and realize it. Thus, the aim of education is to expose and activate the potential hidden in every individual and the purpose of schools and teachers is to enable it, to help pupils realize their personal abilities to allow them to live balanced, happy life. [Aloni, inside Levy-Feldman, 2020].

A study of the American Scholar Ma Lipping [2010], establishes this concept and shows that what matters is teaching skills characterizing the good teacher, rather than his/her academic education. The study attempted to provide an explanation to the current situation in which Chinese pupils succeed in international Math tests more than American pupils in primary school as well as in high-school, regardless of the fact that the education level of the Chinese teacher is lower than that of the American teachers, as most Chinese teachers have 12 years of formal education, while most American teachers have 16 years of formal education. In addition, the physical conditions and teaching aids available to the American teacher are better, and the number of pupils in class in China is larger, the Chinese teachers manage to teach better the material. Lipping found that the Chinese teachers know how to teach mathematic better than the American teachers. Not High-level Math, only the Math relevant to the learning program.

They understand the concept deeper, understand better its difficulties, and therefore they are able to explain and teach better. The scholar deducted that the solution would probably be to invest more in imparting the teachers better teaching skills instead of raising the bar of the academic requirements. [Ma, 2010].

The good teacher's qualities should present a teacher with awareness and commitment to differences among pupils; he/she has to be caring, emphatic and attentive to their basic intellectual and emotional needs. He/she had to understand the pupils, the developmental stage they are in, their previous experiences and learning styles, as well as the personal background and motivation of each of them. He/she should know their fields of interests, and world view of each of his pupils. He/she must be flexible and address the difference between the pupils to motivate each of them to learn, to get involved, to seek understanding and personal development [Darling, Hammond & Snyder, inside: Levy-Feldman, 2020].

The teacher should possess general and traditional knowledge and pedagogic skills including the ability to manage a class, prepare lesson plans and evaluate the pupils' work. He/she should have experience in the pedagogic skills required for the relevant content field, so he/she could present ideas relating to the specific content field and point out links between them and other subjects to the pupils in a clear and accessible mode. However, he/she should also adopt innovative skills including the ability to cope with frequent changes in the class, the school and in the educational system at large and learn from them. This is the "pedagogy of uncertainty", a pedagogic approach demanding awareness and recognition of the need for change among Good teacher, the ability to use consideration, based on understanding and familiarity with results of various educational actions, to be able to improvise and to respond flexibly, [Yosiphon & Shmida, inside: Levy-Feldman 2020].

To be perceived as a good teacher, he/she had to change his/her general perception of standard teaching, learning and focused evaluation, to a perception emphasizing personal instruction and support that recognizes the difference between learners and the need to tailor personalized mentoring plan. [Gidron, 2011].

He/she has to pay attention and focus on teaching ways based on three interrelated abilities: the ability to assess, the ability to share and the ability to improvise, all of which are expressed in a variety of dialectical contexts at the intersection between dialogue frameworks and action frameworks, with an emphasize on mentoring pupils within teaching. The perception of the good teacher should be standing in front of the teacher's eyes in his teaching work when he makes the necessary transition from teacher to mentor-teacher. This approach focuses on transition from learning teaching and assessment in the spirit of positive perceptions to constructive perceptions,

emphasizing the active nature of the learning processes. He/she has to move from authority bases teaching that see learners mostly as passive dependent individuals in a compulsive learning environment receiving knowledge from another source, to seeing the learner as able and more independent. [Libman, 2013]

A survey conducted among Math teachers revealed that teachers' perceptions/beliefs significantly affect their work in the field, their perception regarding their role in class, their choice of mathematic tasks for their pupils and their teaching approach. These beliefs relate to positioning the teacher/pupil in the center of the mathematic learning/teaching process, beliefs which are reflected by the interrelations in class, and beliefs regarding learning characteristics of mathematics.

Beliefs concerning the centralization of teacher/pupil in Math teaching are on the continuum between an active teacher and a responding pupil, according to the following specifications:

- 1) Teaching and learning are passing knowledge from the teacher to the pupil. The teacher is in the center because he/she possesses the knowledge and the pupil is the empty vessel that is supposed to receive and contain it.
- 2) Teaching and learning are performed by the teacher's guidance and instruction. The teacher functions as an intermediary between the material and the learner, he/she demonstrates or presents it to the learner and the learner learns by imitation.
- 3) Teaching and learning are carried out by empowering and nurturing the learner, teacher and learner are equal active partners in structuring the knowledge of the learner.
- 4) Teaching and learning are carried out by actions of guidance and structuring the learners' knowledge. The learner is in the center of the knowledge formation and the teacher is an observer whose activity is minute.

There are beliefs concerning learning characteristics that encourage understanding of Math. These beliefs refer to behaviors and mental activities of the learner involved in the learning process. For example: by means of investigation and independent search for knowledge, problem solving, the reasoning and explanation in the study of mathematics, providing tasks that involve the search for regularity and generalization The importance of having a mathematical discourse as part of the teaching process, and the importance of incorporating dynamic and digital representations contributing to the learning advancement. All define the

teacher's preferred ways of teaching and learning and are called: pedagogic beliefs. [Karamarsky & Michalsky, 2015].

The findings also indicated that when it comes to teaching and learning, Math teachers tend to adhere to their own perceptions; they tend to teach and learn in the ways they learned themselves, usually in frontal teaching by means of knowledge transmission and memorization, and have little inclination to change their pedagogic perceptions and their teaching behaviors. Therefore, the teaching centralizes on the teacher and does not emphasize the self-direction to learning. To bring them to innovative teaching which is a combination of thinking development, problems solving in teaching and technology there is a need to change the modes of teaching-learning and the role perception of both teacher and pupil. The good Math teacher has to initiate thinking events, navigate their occurrence, give students time for thinking and thus help them to develop during the process. [Karamarsky & Avital, 2016].

In the Israeli multi-cultural society, there are a number of different educational systems of different ideologies and it is very difficult to agree on shared perception and/or values. However, the examination of the good teacher relies on the two main perceptions: the teacher as an expert in the given knowledge area, and his/her teaching skills, and the teacher as a person. However, this division is not unequivocal, since there are a number of characteristics that appear in both perceptions [Levy-Feldman, 2010]. In the personal aspect, the good teacher, , is an educated cultural person, who can form meaningful connections and can cooperate with team members. Together with his/her knowledge, tools and skills, the teacher brings to the class himself as a person with his strong areas and weaknesses, his commitment to teach, his/her confidence in his/her personal ability, his/her values and beliefs that some of them are culture dependent.

The teacher must be aware of him/herself, the components of his/her identity and his/her personal perceptions. He/she should understand the processes activating him/her and be able to control them. It is also important to note that the requirement of the good teacher in the cultural aspect is to be a fair honest person, that recognizes the differences between people and the differences in their culture and respect these differences. He/she must be committed to defined values and ideals such as: truth, equality, open-mindedness and human dignity. In the professional aspect, the teacher's disciplinary knowledge must be vast, comprehensive, deep and updated. In addition to his/her expertise in the knowledge area he/she teachers, the professional

teacher should be knowledgeable in other knowledge areas that refer to or close to his/her subject matter and in basic educational areas. A deep understanding of children's developmental processes in social and cultural contexts will improve the teacher's work. There are people who believe that among other aims, the teacher's role is to shape the image of Israeli society. For this purpose, the teacher must be well versed in a variety of social, civil and cultural areas related to the subject and keep up to date with them. [Reichel & Kestelman, 2018].

In the Israeli Arab schools, most of the teachers come to the teaching profession with no other choice, because the employment opportunities for Arab academics in Israel are limited. Thus, although the education level among the Israeli Arabs has risen, this rise is not enough to significantly affect their employment status. The teaching method common in the Israeli Arab schools is the traditional monolog method, focusing on the successful pupils whose high achievement is often conditioned by factors, like thinking skills and intellectual ability that had not been determined by the school, but had developed in a supportive family social environment. this method causes negligence of the pupils with learning difficulties which are specially depending on the school. In this method, the good pupils are those who accumulate the knowledge the teachers obediently impart. Teachers in the Arab schools are placed in a dilemma regarding the ministry of education, since they are required to disown the Arab Palestinian culture and identity and accept the Israeli Zionist values. the teachers feel that they are in dilemmas and conflicts, on one hand, they are expected to teach and strengthen the Arab Palestinian identity, and on the other, they are supposed to teach according to the Israeli curricula that does not contain other identities. The teaching methods and the curricula used in the Arab education are not connected to the social and cultural changes taking place in the Israeli Arab society. Thus, the schools direct their educational work to academic achievements and focus on visible short-term products, such as imparting knowledge and developing instrumental skills, rather than educating for values and identity [Alian, 2017].

A study conducted in 2016, among Arab Math teachers and principals in Israel, presents the good teacher for Teaching 5 Math units in schools. According to the teacher's responders, in order to be able to cope with the pupils' questions, create interest and teach in heterogeneous classes, the teachers' training level must be high, and they are expected to have an extensive mathematic knowledge, alongside diverse pedagogic skills. Both teachers and principals

attributed significant importance to creating a personal connection with pupils. In their opinion, a humane teacher who understands the pupils and supports them and can encourage them, harness them to learning and challenge them. In addition, some teachers claim that the courses for expanding certification and professional retraining promote those who pass them while others claim that they are unnecessary. However, most of them explained that a good teacher, especially a teacher who teaches 5 units in Math, is required to invest a lot of time; both in the school's framework, in after school hours and during vacations, for planning the teaching & exercises, helping pupils and preparation for matriculation exams. [Mani-Aiken, Nasser Abu-Alhaje, Rosen & Bashan, 2016].

A study conducted among Arab students preparing to become Math teachers found that as early as during the stage of consolidating their professional identity, they perceive the good Math teacher as an educated intellectual with broad knowledge, who functions as a legitimate and autonomous agent of culture and knowledge and with vast knowledge in the content area, who can also teach it. Nevertheless, they attribute great importance to the way the material is transmitted in an experiential and fascinating way of innovating teaching, and in promoting the understanding of the learners. In addition, they think that good teachers should be sensitive and attentive to the needs of the pupils and dedicate time to them beyond the duties of the role. [Cohen-Azaria, 2020].

The study's aims and objectives

A focused examination of the good teacher perception in the post- modern approach, and the impacts of various factors on the perception of the qualities of the good teacher, a matter that the professional literature lacks. Comparative studies conducted in Israel in recent years between Jewish and Arab students in the subject of the good teacher perception, found that culture does affect the perception of the good teacher. The findings present cultural and linguist differences in the perception of the good teacher image between Jewish and Arab teaching students regarding the teacher's interpersonal relations and regarding the role of the teacher as an instructor, guide and mentor, and regarding the expected teaching style, a teacher focused versus a pupils focused, and regarding the pupils' feelings toward the teacher. [Katzir, Ezer & Shalom, 2007].

The study of Arnon & Reichel, [2009], examined the differences and similarities in the perception of the good teacher among a sample of Jews and Arabs of the general population. The study focused on two aspects: gender and ethnicity. The findings indicate that the positions regarding the good teacher are national culture dependent. The aim of this study is to examine the impact of the cultural identity and the perception of the teaching profession, on the perception of the good teacher's qualities. Studies reveal that culture is an important factor in shaping the teacher's perception of his/her role, and the perception of his/her society, of the qualities of the good teacher. This study will examine the impact of the cultural identity and the mode the teaching profession perceived, on the perception of the good teacher qualities in the Israeli Arab society.

The research questions:

- 1). Is there an influence of the cultural identity of the teacher on the perception of the good teacher qualities, among math teachers of the Arab society?
- 2). Is there an influence of the teaching profession perception, on the perception of the good teacher qualities, among math teachers of the Arab society?

The research conjectures:

- 1). A relationship will be found between the teacher's cultural identity and the perception of the good teacher qualities among Math teachers in the Arab society.
- 2). A relationship will be found between the perception of the teaching profession and the good teacher qualities among Math teachers in the Arab society.
- 3). Cultural identity and the perception of the teaching profession affect the perception of the good teacher qualities among Math teachers in the Arab society.

2. Methodology

2.1. The research method

The study is based on the quantitative paradigm, meaning: gathering and analyzing quantitative data. This paradigm allows to explain phenomenon by searching for causal relationships. The main interest is the product and the cornerstone of the investigation objectivity, meaning, no dependency between the researcher's identity and the research findings. Furthermore, a quantitative research allows the researchers to reach much larger population and draw conclusions to the rule. [Antonovsky, 2012]. For this purpose, we used a questionnaire containing three components measured by Likert scale.

This questionnaire expresses the operative definition of variables. It contained three types of questions: a). Closed end multi choices questions, where the responder has to mark the answer that fits his/her view. B). Statements that will be graded on the 1-5 Likert scale [1 the lowest 5 the highest]. 3) Demographic details: age, gender, family status, years of seniority, etc.

2.2. Sample population

Arab Math teachers of primary schools [federal and recognized non-federal], in northern Israel. The sample included 123 Math teachers.

Table 1 socio demographic characteristics of the teacher's research sample

variable	specifications	N	%	M	SD	MIN	MAX
gender	male	35	28.5				
	female	88	71.5				
Family status	single	29	23.6				
	married	63	51.2				
	Divorcee/widower	23	18.7				
	others	8	6.5				
religion	Druze	9	7.3				
	Muslim	85	69.1				

	Christian	23	18.7				
	Other	6	4.9				
education	BA	40	32.5				
	MA	56	45.5				
	Ph.D.	16	13.0				
	other	11	8.9				
Classes taught	Grades 1-2	13	10.6				
	Grades 3-4	16	13.0				
	Grades 5-6	24	19.5				
	Teaches more than two layers	70	56.9				
Role definition	Teacher	62	50.4				
	Home-teacher	11	8.9				
	Coordinator	2	1.6				
	Member of leading team	12	9.8				
	Deputy principal	5	4.1				
	Fulfills more than one role	31	25.2				
age				41.24	7.4	24	54
Children under 18				2.54	1.63	0	6
seniority				3.29	1.04	1	4

The table presents the following data: sample participants included 35 male teachers and 88 female teachers, in age range of 24-54. Average age 41.24, with standard deviation of 7.04. 40 of them with BA 56 with MA, 16 with Ph.D. and 11 others. All participants were actually teaching in primary schools of the Arab sector during the time the research had been conducted, 13 in grades 1-2, 16 in grades 3-4, 24 in grades 5-6 and 70 in two layers or more. All were relatively rookies with seniority of 1-4 years. Average seniority of 3.29 with standard deviation

of 1.04. Regarding the roles they fulfill in school: 62 are teachers, 11 are home-teachers, 2 subject coordinators, 12 members of the school's leading team, 5 deputy principals and 31 fulfil more than one of the roles specified. Division according to religion: 9 Druse, 85 Muslims, 23 Christians, 6- others.

The research variables

Independent variables: cultural identity, social stances and perceptions, perception of the teaching profession.

Dependent variable – perception of the good teacher qualities.

The research tool

The main tool used in this study was a 4 components multi-purpose questionnaire. [Attachment 1].

The four components were:

- 1). A personal background questionnaire – containing demographic and professional questions.
 - 2). A cultural identity questionnaire,
 - 3). A questionnaire about the perception of the teaching profession,
 - 4). A questionnaire referring to the perception of the good teacher qualities.
1. The personal background questionnaire – contained questions obtaining demographic and professional data, like gender, age, role in school, social status etc.
 2. The cultural identity questionnaire: developed by Awad and others [2009] contains 117 items examining the teacher's perception of: a). perceptions and positions regarding a collective society [50 items]. b). perceptions and positions towards religion [8 items], c). Perceptions and positions regarding appointment of roles according to gender [59 items].

The participants were asked to mark their position regarding the statements in these three components. Each statement was marked according to 5 options scale, from: 1= absolutely disagree to: 5=absolutely agree.

The reliability of questionnaire had been validated twice with an Alfa-Kronback test [Awad, Zuabi & Halil, 2010].

3. This is a closed –end questionnaire with Likert answers’ scale of 5 options. This questionnaire is a combination of two questionnaires used previously in other studies: a). the perception of the teaching profession that was used in the study of Awad & others [2009] and in Arnon & Reichel, [2009]. In addition, b). We included a number of statements used in the study of Sagi & others, [2002].

4. The questionnaire regarding the qualities characterizing the successful teacher was originally built by American scholars [Edwards et al, 1983] This 25 items questionnaire was also used by Sherman & Ben-Menachem [1990].

The research process

The first step was to receive permission from schools’ principals to include the relevant teachers in their schools in the research sample. The request was discussed with the principals the aim of the research presented and explained. [attachment 2]. After permission from the principals was received, the questionnaire had been distributed among teachers who agreed to participate.

Due to the Corona pandemic, the questionnaire was built in a google format and was sent by link to the participating teachers. The data was obtained by means of the same technology and was fed into SPSS program for analysis. Discretion and anonymity of the participants were kept throughout the research.

Method of data analysis

The data obtained was analyzed by IBM SPSS Statistic 22 program. The first two research conjectures, the relationship between the cultural identity and the perception of the teaching profession and the perception of the good teacher’s qualities, were examined by Pearson correlation for connection measures. The third conjecture regarding the impact of the two variables, the cultural identity and the good teacher’s perception, on the qualities of the good teacher was examined by multi-variables regression analysis.

General background

This study discusses the relationship between the cultural identity and the perception of the qualities expected from good Math teacher in the primary schools of the Israeli Arab sector.

The research conjectures derived of the research questions are presented in page 21.

The first stage contains a presentation of the descriptive statistic for all the measures calculated from data obtained by the research questionnaires. The second stage presents the results of the research conjecture examination.

Descriptive statistics – table 2 presents descriptive measures for perceptions' dimensions and social positions, cultural identity of the sample.

3. Finding

4. Table 2 – descriptive statistic for cultural identity questionnaires.

Cultural identity	M	SD	MIN	MAX
Positions regarding a collectivist society	3.57	0.48	2.45	4.91
Position regarding the religion	4.67	0.47	2.75	5.00
Position regarding gender roles	3.14	0.66	2.19	5.00

Table 2 shows that the most positive index of the cultural identity was the of position towards the religion [M=4.67]. This measure also received the lowest standard deviation [0.47], The position regarding gender roles received the lowest average [M=3.14], but it also received the highest answer differentiation [SD= 0.66]. Thus, we can conclude that the teachers that have participated in this study are characterized by positive position toward religion and inclination /preference for collectivist society.

Table 3 – descriptive statistic for dimensions of the questionnaire examining the perception of the successful teacher’s qualities

The successful teacher qualities/traits	M	SD	MIN	MAX
Characteristics of the successful teacher [general]	3.93	0.64	2.96	5.00
Communication and development of pupils cognitive skills	3.97	0.67	2.33	5.00
Creating pleasant relax atmosphere in class	3.92	0.84	2.25	5.00
Professional level and knowledge control	3.81	0.97	2.00	5.00
Classic updated teaching	3.67	1.17	1.50	5.00
Coping with learning environment	3.96	0.57	2.40	5.00

Table 3 shows that the two indexes reported by the participants as characterizing them most were: development of communication with the pupils together with development of pupils’ cognitive skills, [M=3.97], and coping with the learning environment [M=3.96]. a measurement that was also with the lowest diversity ratio [SD=0.57]. On the other hand, the trait that was considered by the participants as the list characterizing them was classic updated teaching [M=3.67], which was also the trait that received the highest standard deviation [M=1.17].

Table 4 – Descriptive statistic for perception of future teaching profession

Perception of future teaching perception	M	SD	MIN	MAX
Future profession [general]	3.36	0.54	2.76	5.00
Security and independence	3.66	0.65	1.71	5.00
Mission	3.58	0.77	2.11	5.00

Table 4 shows that the two components comprising the perception of the teaching as future profession the scale of security and independence received a higher average mark [M=3.66] than the component pertaining to the feeling of mission [M=3.58], the component that shown the highest standard deviation [0.77].

Examination of the research conjectures

Calculation for examination of two research conjectures [No 1 & 2], was performed by means of Pearson adopter coefficients. Table 5 presents the adopter coefficients values among the index components of: cultural identity, the successful teacher, and teaching as future profession.

Conjecture No 1: A relationship will be found between the teacher's cultural identity and the perception of the good teacher qualities among Math teachers in the Arab society.

Table 5 - coefficients of correlations between: the perception of cultural identity, the successful teacher's characteristics and the perception of teaching as future profession

Cultural identity	1	2	3	4	5	6	7	8	9	10	11	12
1).Positions regarding collectivist society	-	- .05	.35''''	.72''''	.62''''	.64''''	.62''''	.56''''	.61''''	.53''''	.13	.52''''
2). Positions towards religion	-	-	-.03	-.10	-.01	-.15	-.22'	-.20'	.08	-.22'	.03	-.19'
3).Positions towards gender roles			---	.48''''	.54''''	.37''''	.39''''	.34''''	.38''''	.14	-.07	.26''''
4).The successful teacher's characteristics [general].				---	.88''''	.86''''	.90''''	.84''''	.81''''	.65''''	.14	.63''''
5).Developing cognitive communication					---	.64''''	.66''''	.63''''	.75''''	.47''''	.29''	.40''''
6). Creating relax atmosphere						---	.81''''	.85''''	.55''''	.62''''	-.10	.66''''

7).Professionalism, knowledge mastering							---	.87''''	.60''''	.61''''	-.07	.65''''
8). Classical updated teaching								---	.45''''	.62''''	-.16	.69''''
9). Coping with learning environment									---	.52''''	.40''''	.42''''
10). Future profession [general]										---	.39''''	.90''''
11). Security & independence											---	.07
12). Mission.												---

*** $p < .0001$, ** $p < .01$, * $p < .05$

The first conjecture presumed that a connection between cultural identity and the perception of the good teacher qualities among Math teachers in the Arab society will be found.

The two scales of cultural identity – the components of collective and individual indexes were found in statistically clear positive linear relationship with the components of the successful teacher: developing pupils' communication and cognitive abilities creating and maintaining relax atmosphere in the class, professionalism and mastering of the knowledge, updated teaching skills and the ability to cope with the learning environment, when the strength of the relationship ranges between 0.56 to .72.0

Statistically clear positive linear relationship was also found between the positions towards gender roles and the successful teacher components when the relationship strength is in the range of 0.34 to .54.0.

The positive correlation coefficients indicate that teachers holding positive perceptions regarding collectivism and/or positive perceptions regarding gender role inequality are the teacher that have more faith in the required traits of the successful teacher. Note that the correlation coefficients received between the measure of position regarding collectivism and the measures of the successful teacher were

of medium-high strength while the correlation coefficients regarding position towards gender roles were medium.

Note that the religion components as one of the cultural identity components was found in clear negative relationship and relatively low strength with the two components of the successful teacher measurements: creating and maintaining relax atmosphere in the class and the professionalism and knowledge mastering level. Meaning, a higher level of teacher 's religiousness will be expressed in lower ability to create a relaxed atmosphere and also at the teacher's professional and knowledge level within the learning framework.

To sum it all up: two of the cultural identity dimensions were found to have clear positive relationship with all the traits index of the successful teacher, but the religion component was slightly negatively connected to only two components in the successful teacher index. Therefore, it is possible to validate most of the first conjecture but with reservation regarding position towards religion.

The second conjecturer: A relationship will be found between the perception of the teaching profession and the good teacher qualities among Math teachers in the Arab society.

The findings indicate that the security and independence component of the teaching profession perception index has clear positive relationship of medium strengths with the following components of the successful teacher traits index: development of cognitive communication, [0.29] and coping with learning environment [.40.0]. the findings also indicated that the correlation coefficients of the security and independent component with the rest of the components comprising the perception of the successful teacher are insignificant.

In addition, the findings show that the mission component of the teaching profession perception index is in clear positive relationship of medium and high strengths [between 0.69 – 0.4], with the components: development of pupils' communication and cognitive skills, creating and maintaining relax atmosphere in the class, high level of knowledge and professionalism, updated teaching skills and the ability to cope with the learning environment of the successful teacher's traits dimension. Therefore, teachers with more positive perceptions in general about the teaching profession and also about the sense of mission to the profession will be characterized with high levels of the successful teacher traits in general, including all of its distinctive components mentioned above.

On the other hand, the third component of the questionnaire of the future teaching profession perception – security and independence, was found to have a distinctive relationship with two of the six traits of the successful teacher: developing the pupils’ communication and cognitive skills, [low strength], coping with the learning environment [medium strength]. Therefore, high levels of security and independence sense in the teaching role will be expressed by high level ability to develop pupil’s communication and cognitive skills, as well as the ability to cope with the learning environment.

As mentioned above, two of the future teaching profession perception dimensions, were found to have a distinctive relationship to all the components of the successful teacher’s dimension, but the sense of security and independence component within the framework of the teaching role had only weak to average relationship and only to two of the six components. Therefore, the second conjecture was generally validated, but with a reservation regarding the security and independence sense component.

The third conjecture: the cultural identity and the perception of the teaching profession affects the perception of the successful teacher’s traits among Math teachers of the Arabic society.

For this purpose, we built a table presenting the 6 estimations/ predictions listed in the conjecture, and the data gathered by the relevant questionnaire. Once we got all the data we performed a multi-variable regression analysis to validate the conjecture.

Table 6 presents the regression model of the good teacher qualities predictors by cultural identity and perception of the future teaching profession.

	B	SE β	β	P
Cultural identity				
Positions towards collectivist society	0.54	0.08	.41	.00
Positions toward religion	0.03	0.07	.02	.71
Positions towards gender roles	0.27	0.05	.28	.00
Perception of future teaching profession	0.48	0.07	.41	.00
R^2		.69		
F		66.08***		.00

The nature of the regression model adjustment was found to be significant. [$F_{(4,118)} = 66.08, p < .001$]. the model managed to explain about 69% of the differentiation in the predicted variable – the good teacher’s qualities, positions towards collective society component, [belongs to the cultural identity dimension], and the perception of the future teaching profession shown the highest distinctive contribution in predicting the good teacher qualities. Another distinctive contribution beyond the rest of the predictors was to positions towards gender roles. Note that the component of the positions towards religion did not show another distinctive contribution in prediction the qualities of the good teacher.

Discussion

This study examined the relationship between cultural identity and perception of the teaching profession with the perception of the good teacher’s qualities among Math teachers of the Israeli Arabic sector. The research questions were: is there a relationship between the teacher’s cultural identity and the perception of the good teacher’s qualities? And is there a relationship between the perception of the teaching profession and the perception of the good teacher qualities among Math teachers in the Israeli Arab society.

The first conjecture held that a distinctive statistical relationship between the teacher’s cultural identity and the perception of the good teacher’s qualities will be found. The findings indicated that two of the cultural identity components, collectivism and positive perception towards gender roles inequality relate to to all the traits of the successful teacher, however, the religion component of the cultural identity was found to have only weak relationship with only two of the successful teacher’s traits: creating and maintaining relax atmosphere in the class and professionalism and level of relevant knowledge.

Thus, the core of the first conjecture can be validated, with reservation regarding one of the cultural identity components - the position towards religion. A finding supporting the finding of Awad, Zuabi & Halil [2010], whose study revealed that the cultural identity components relating to the of Arabic religiosity might change, or at least affect, the perception of the good teacher. The more the student [of teachers’ college] are religious, they attribute less importance to the good teacher’s qualities relating to classical updated teaching, while on the other hand, students with modern perception prefer the approach of gender equality and perceive the good teacher not only as a source of knowledge but also as an educator who develop the pupil’s personality. Arar & Ibrahim [2016] who describe the situation of the

Arab teacher in Israel, claim that both teachers and principals feel uneasy to discuss national issues and to engage in topics emphasizing the Arabic cultural identity. They are anxious regarding the response of the ministry of education, as discussing these issues in class might be interpreted as incitement and they might be punished. So they prefer to ignore these topics. But at the same time they feel offended and humiliated of the situation, so they prefer to present their true perception by means of the collectivist culture that characterizes the developing non-western countries that perpetuates the centrality of the group and the collective. This way, the teachers and principals attempt to adopt legitimate methods and conduct activities that enables them to engage in national and political issues and nurture the national identity of the pupils without giving the impression that they are actively incite. These feelings and perceptions also guide the coping ways and pattern of activities in this context in the school, without emphasizing the religious aspect in order to appear as good educators, avoiding colliding with the state education system. The research literature validates these findings.

The second conjecture held that a relationship between the perception of the teaching profession and that of good teacher qualities. The findings revealed that teachers with more positive perception regarding the Math teaching profession and a sense of mission regarding teaching will be characterized with high levels of the successful teacher traits. They also revealed that sense of security and independence in a teaching role, have a strong relationship with development of pupils' communication and cognitive skills with the ability to cope with the learning environment, and a weak to medium strength relationship with creating and maintaining a relax atmosphere in class level of professionalism and knowledge, and updated teaching skills.

So in general, the second conjecture can be validated, with reservation regarding creation and maintaining a relax atmosphere, level of professionalism and relevant knowledge, and updated teaching skills.

According to Wider [2018], the Math teacher fulfills a key role in the pupils' emotional and academic advancement in all academic subjects but especially in mathematics. A good Math teacher should be confident regarding his/her skills and expertizes to advance his/her pupils academic achievements. This teacher perceives him/herself as fulfilling his/her mission to promote the achievements of the students along with his/her professional aspect of imparting knowledge, planning and teaching the lesson and correcting the pupils' performance. The Dahaf institute [2012] sharpens the mission of the Math teacher by noting that the choice is not an impressive attractive profession, as the salary is low, there is hardly

any professional advancement and there are other options in the work market. Regarding social status, the profession image is poor, as it is considered as a profession of people who either have no ambition or no choice. Its media exposure in general is also poor, work conditions and work environment are undesirable, the class is a battle field, aggressive parents cause humiliation of the teacher, and often he/she has to continue his/her work at home. So in general, the Math teacher knows in advance that he/she will be engaged in hard work in difficult conditions. So, it stands to reason that a person who chooses to become a Math teacher has positive perception of the profession more than anything else. According to Arnon, Frenckle & Rubin, [2012], the love of the mathematic profession, the interest in it and the challenge in teaching it are the most determinative considerations of Math teachers in choosing it. They aspire to develop communication and cognitive skills, and cope with a learning environment of a difficult subject, in hope to succeed.

Bshara, [2016] elaborates on the subject specifying that Math teachers are aware of the fact that they teach one of the subjects considered among the most difficult of the knowledge fields taught at school, from their very first year on the job, since during lessons when the teacher is required to teach Math, he/she is required to cope with diverse issues. In addition, the teacher is required to create a relaxed atmosphere in the class and maintain it, professionalism and mastering of the relevant knowledge, and updated teaching skills. A teacher, who comes with positive perception to Math teaching and sees it as a mission, is a good teacher. The research literature validates these findings and insights.

The third conjecture held that the cultural identity and perception of the teaching profession affect the perception of the good teacher's qualities.

The findings revealed that the positions towards collectivist society [cultural identity], perception of the future teaching profession and positions regarding gender roles were the best contributors for predicting the qualities of the good teacher. However, the positions towards religion did not provide distinctive contribution in predicting the qualities of the good teacher. Thus, the third conjecture is generally validated but with reservation regarding the positions towards religion component.

The findings of Magen-Nagar & Steinberg, [2016], support the findings of this study. In their study of *The Teachers' World in a Changing Reality*, they observe that the teachers' world, is saturated with conflicts and coping with them, which contribute to the consolidation of their professional identity process. Arab teachers in general, and Arab Math teachers in particular, have difficulty consolidating their professional identity; due to conflicts within the society they live in on one hand, and the fact that

they are part of the educational system on the other. These researchers found that the environment has a determinative effect on the conflicts' complexity, and Arab teachers in Israel, are forced to deal with interpersonal conflicts of Arab cultural identity versus the Israeli culture. They hold that the identity conflict has a crucial role of a catalyst that drives processes of professional identity formation, in an era of changes in the education system.

Newman [2016], connects the subject of professional identity to the image of the good teacher perception, claiming that the ethno-cultural components of the identity are more dominant regarding differences in the perception of the good teacher. When Arab teachers present a clear and cohesive view regarding the image of the good teacher, they attach great importance to the teachers' ethical-moral character. According to Arnon & Reichel, [2009], the cultural social political context Arab teachers are working in, explains the ways perceptions regarding the good teacher were formed. Awad, Zuabi & Halil, [2010] also explain that Arab teachers define the good teacher according to collective society components, religion and gender inequality. Regarding the attitude towards religion, their study revealed that the more religious their research participants [students in Teachers College] were, the less importance they attributed to traits relating to classical updated teaching. Students who preferred the gender equality approach tended more towards the modern perception seeing the teacher not only as a source for knowledge but also as an educator who develops the pupil's personality, and emphasized the importance of traits expressing professional work of the teacher with consideration to the pupil's level. Thus, the research literature validates the findings.

Summation

The research questions examined the relationship between the cultural identity and the perception of the teaching professions, and the perception of the good teacher qualities among Math teachers of the Arabic sector in Israel. The research findings show that two of the cultural identity components – collectivism and positive perceptions regarding gender inequality are distinctively related to all the qualities of the good teacher image, and that teachers with more positive perception of the Math teaching profession who also view the teaching profession a mission, are characterized with high level of the good teacher's qualities. It also revealed that the perception of the future teaching profession and the position towards

gender roles were the best predictors of the good teacher's qualities, while the religion components has weak relationship to the good teacher's qualities.

The Arab school is in the hub of the national, moral and educational arena of the Arabic society in Israel., reflecting the reality experienced by the Israeli Arab society. Several factors influence the school, direct its activity and dictates its policies in various levels. Regarding the issue of national identity, Arab teachers are placed between two opposing forces affecting them and their perception of the good teacher. One is the state that requires them to build the pupils' civil identity along with the definition of Israel as a Jewish democratic state, suppressing any national Arab expression among the pupils, and the other is the Arab society represented by informal factors requiring the school to educate the pupils according to the norms and values of the Arab society, emphasize the Palestinian narrative and the components of its national identity. The teacher is required to form his/her identity as a good teacher between these two poles. As a Math teacher, he/she has to develop the pupils in his/her subject matter and seek help in legitimate and informal ways by the state to educate and teach while creating a balance between the contradicting demands of the state and the Arab society. In order to be considered as a good teacher in a difficult academic subject like Math, he/she has to perceive education for Arab national identity without breaking the law or violate the guidance of the ministry of education, he/she should perceive education for national identity as one of the obligations the school he/she works in, is committed to, and simultaneously, aspire to be a good teacher. The choice in the profession of Math teacher in primary school is a mission deriving from the love of the subject, and the will to educate the pupils by means of teaching this complex subject. In order to cope with a mathematic problem, the pupils must from the very beginning, to engage means of deciphering, coding, writing, encrypting and others, in a new language which is of no use in daily life. While applying their mathematical skills, the pupils, beside coping with problem, have to understand the mathematic terminology [Bruun, Diaz& Dykes, 2015].

When he/she teaches his/her subject matter, the math teacher has to deal with several problems; to answer the needs of the pupils, he/she has to develop divers complex cognitive creative strategies. The good teachers are teachers perceiving the essence of Math teaching and their future in the profession from these aspects, coming to teaching from a place of desire and mission to advance the students. [Rosenberg, 2010].

Theoretical contributions of the study

The importance of this study is in its reference to the cultural context in Math teaching. The social and cultural context in every academic subject is important to allow the pupils to connect to the subject. Phrases of sentences and problems refer to the classical world. For example: the parallel axiom: instead of teaching that these are straight lines in a plane that will never meet, it has to be phrased: straight lines in a plane which are which are perpendicular to the same straight line. The classical phrasing is part of the culture, thus, phrases distant from the culture, in this study the Arab culture, will change the understanding of the material. The same applies to exercises and research topics. A good teacher can translate the required terminology to the pupils' culture, and it is important to do it, so from early childhood the pupils will see the relationship between Math and life.

Another contribution is this study is the understanding that a good has to come to the profession from sense of mission and love of Math. A considerable part of the rookie teachers lose these feelings during their first years of working in school. It is imperative to recognize this phenomenon, understand why it occurs, and what could be done to retain teachers over the years so that burnout would not reduce the quality of their teaching.

Applicable contributions of this study

The findings of this study indicated that to adequately prepare a good Math teacher it is imperative to combine academic training in the specific discipline and the teacher's training with emphasis on subject matter methodology learned in teachers' colleges. In order to be a good teacher the teacher must be able to maintain meaningful dialogue with his/her pupils; thus, he/she must know Math regardless of the pupils' cultural identity. A bachelor's degree in mathematics allows the teacher to rise above the local culture and enriches his/her the associative world beyond just teaching. A confident educated teacher can share the beauty, aesthetic, logic and meaning of the learning content with his/her pupils. In addition, the study shows that the teachers ability to advance their pupils mathematic understanding depends on their training as well as on their mathematical knowledge. To succeed in training a good teacher their pedagogic training should include development of conceptualization, analogy and generalization alongside comprehensive knowledge of the subject matter enabling to master the various languages used in mathematic context, like the language of the verbal problems, the illustrative language, talking

language and formulas. The higher challenges that will be included in Math teachers' training will lead to appreciation of the Math teaching profession and enable the teachers to engage in teaching which is not culture-dependent, and development of a good teacher. We hope that decision makers will accept the reliability of this study and its findings and make an effort to implement the required reforms to advance the skills, capability and knowledge of Math teachers.

Research limitations

The study was conducted in a number of Arabic schools in Northern Israel, so the findings relate to one limited district. Therefore, to get a better picture, it might be advisable to conduct similar studies in other districts [center and south] and compare the findings.

The study was conducted during the time of the covid-19 pandemic, when teaching methods changed and so did the requirements from the teachers, to accommodate the new circumstances; several schools were shut down, and the teachers had to adjust and teach from distance. To many of them it came with high price. In addition, on one hand they felt under greater stress and on the other they felt less empathy to the pupils compared to teaching in class. The finding reflects teachers in time of crisis, a fact that should be taken under consideration. Therefore, it would be advisable to conduct a similar research when the crisis will be over and life will return to normal.

Also the concept “the good teacher” that had been investigated in this study could have been affected by the above mentioned crisis, due to the teaching by digital means. Thus, a teacher who does not control these means and have difficulties to teach with online systems. Note that in the Arab culture, the digital world was slower to enter compared to the pace it entered into the Jewish culture. Thus, the digital means were much less accessible to both teachers and pupils. In addition, most teachers had to cope with the need to teach online, without ever being trained to do so and often time with lack of the required skills. Although many teachers sought help in their community, it is already known that several situation-derived problems had not been solved.

Another limitation is the research too: the data gathered only by questionnaires distributed online. Thus, the researcher cannot tell who answered, and in what situation was the responder when he/she filled up the questionnaire. In addition, the responders answered closed questions and had no opportunity to elaborate. Therefore, it is recommended to conduct a qualitative study of similar approach that includes a

research tool of constructed or semi-constructed interview to enable the responder to describe his/her feelings, thoughts and approach towards the good teacher issue, whether or not he/she perceives him/herself as a good teacher, why, and what he/she is willing to do to improve his/her work as a teacher and his/her self-view as a good teacher.

In addition: due to the relatively small size of the sample, and the sampling method [due to the Corona], it is possible that the results cannot be generalized. There is also the possibility of bias in the results as a due to the relatively “considerable” sampling error.

Attachment No 1: multi-purpose questionnaire

Teachers' Questionnaire

Dear teachers, this questionnaire is part of a final study for a master's degree in teaching. Its aim is to investigate the relationship between the cultural identity, and the qualities characterizing the successful teacher and their impact on the perception of the teaching profession in junior high and high schools of the Arabic sector in northern Israel. I will be much obliged if you will dedicate about 10 minutes of your time to fill up this questionnaire. This questionnaire is for research purpose only. It is intended for both male and female teachers but it is written in male form only for convenience – and without prejudice to rights.

Part 1 – a demographic survey:

- **Gender:** male female
- **Age [years]:** _____
- **Social status:** married single divorcee/widower other_____
- **No of children under 18:** _____
- **Religion:** Muslim Christian Druze Other
- **Professional seniority:** 1-5 6-10 11-15 16-20 21+
- **Academic degree:** BA MA PhD. Other_____
- **Class you teach [you can mark more than 1]:** 7 8 9 10 11 12
- **Your role at school [you can mark more than 1],**
Teacher Home-teacher coordinator member of leading team Deputy Principal

Part 2 - cultural identity questionnaire

The collectivism/individualism component

Below is a list of statements, please mark in a circle the measure of your agreement with each one of them on a 5 grades scale, when 1 – means: do not agree at all, and 5 means: I most certainly agree.

Statements						
No.	Statements	Absolutely disagree	disagree	Partially agree	agree	Most certainly agree
1	My happiness depends mostly on the happiness of people around me	1	2	3	4	5
2	In general I sacrifice my personal best interests for the good of the group	1	2	3	4	5
3	I like to share small things with my neighbors	1	2	3	4	5
4	If a relative is immersed in economic problems I would help him within my power	1	2	3	4	5
5	I feel good when I cooperate with others	1	2	3	4	5
6	A child whose parents received an award is supposed to be proud	1	2	3	4	5
7	I must consider the will of my family even if I have to sacrifice my own wish for that	1	2	3	4	5
8	After all a person feels closer to his affiliation group than to any other group	1	2	3	4	5
9	A mature person understands that he has to behave in accordance with the honor of his affiliation group	1	2	3	4	5
10	A mature person understands the needs of his affiliation group and acts to fulfill them	1	2	3	4	5
11	A person of character helps people from his affiliation group before he helps others	1	2	3	4	5

12	If you know who is my affiliation Group you know who I am	1	2	3	4	5
13	What is good for my affiliation group is good for me	1	2	3	4	5
14	Without loyalty to my affiliation group I th is no self-realization	1	2	3	4	5
15	My personal goals correspond to the goals my affiliation group	1	2	3	4	5
16	In my discussions with others, I prefer to b direct and honest.	1	2	3	4	5
17	I am a unique personality	1	2	3	4	5
18	What happens to me is the result of my doings	1	2	3	4	5
19	My successes are the fruit of my own talents	1	2	3	4	5
20	I like being unique and different from othe	1	2	3	4	5
21	I am annoyed when people succeed to perform better than me.	1	2	3	4	5
22	Competition is one of the laws of nature	1	2	3	4	5
23	I feel under pressure when other succeed i performing better then I	1	2	3	4	5
24	It is impossible to build a good society without competition	1	2	3	4	5
25	It is important to me to do my job better than others	1	2	3	4	5

The religious component

Below is a serial of questions relating to religious beliefs. Please read the questions and mark in a circle the most suitable answer.

No.	Statements	Very little	little	medium	much	Very much
1	To what extent you believe in God?	1	2	3	4	5
2	To what extent you believe in the prophets/messengers?	1	2	3	4	5
3	To what extent do you believe in the Holy Books/Scriptures?	1	2	3	4	5
4	To what extent do you believe in the angels?	1	2	3	4	5
5	To what extent do you believe in The last days/dooms day?	1	2	3	4	5
6	To what extent do you believe in fate?	1	2	3	4	5
7	To what extent do you keep the commandments of religion [like prayers and such]?	1	2	3	4	5
8	To what extent are you convinced that your religion is the right and the only/exclusive religion?	1	2	3	4	5

The role distribution according to gender component

Below is a list of statements, please mark in a circle the measure of your agreement with each one of them on a 5 grades scale, when 1 – means: do not agree at all, and 5 means: I most certainly agree.

No.	statements	Absolutely disagree	disagree	Partially agree	Agree	Most certainly agree
1	In a good society there should be differences between role of men	1	2	3	4	5

	and role of women.					
2	A person's gender should not affect in his/her role distribution in the society	1	2	3	4	5
3	It is more important to direct boys rather than girls to high education or a professional career	1	2	3	4	5
4	Men and women have the same right to experience different employments	1	2	3	4	5
5	Women should not aspire for independence, since it is the role of the man to take care of their needs	1	2	3	4	5
6	It is undesirable that a woman's position would be higher than that of her husband	1	2	3	4	5
7	A woman that wishes to learn and obtain education should do so even if her education will be higher than that of her husband	1	2	3	4	5
8	A woman should do anything to satisfy the will of her husband	1	2	3	4	5
9	Women do not have to struggle for positions and public influence	1	2	3	4	5
10	A woman can have higher salary than her husband	1	2	3	4	5
11	For reason modesty and family honor it is desirable that the woman should not go to work	1	2	3	4	5
12	A mother preferring career rather than her family is a selfish woman	1	2	3	4	5

13	A woman, more than a man, should please her spouse's will	1	2	3	4	5
14	A father preferring career rather than his family is a selfish man	1	2	3	4	5
15	Women should not penetrate professional areas considered male areas	1	2	3	4	5
16	A woman preferring career upon her family should not feel guilty about it	1	2	3	4	5
17	The woman has the right to develop in every possible area	1	2	3	4	5
18	Parents should encourage independence among girls as much as they encourage it among boys.	1	2	3	4	5
19	The greatest aspiration of every woman should be to marry and start a family	1	2	3	4	5
20	Men are more qualified than women for logical thinking	1	2	3	4	5
21	A woman can head a working team that includes men subordinate to her	1	2	3	4	5
22	Women are capable to be independent and take care of themselves	1	2	3	4	5
23	A woman should plan her future career according to her skills and aspirations	1	2	3	4	5
24	It is undesirable that the woman's education will be higher than that of her husband	1	2	3	4	5

25	Even women that want to become scientists or physicians, marriage and family should take priority over career	1	2	3	4	5
26	The most important role of a woman is to cause happiness to her man	1	2	3	4	5
27	A girl cannot make plans for the future because her plans depend on her husband	1	2	3	4	5
28	It is desired that the woman will not be employed so she will be able to assist her husband in his professional advancement	1	2	3	4	5
29	Women advancement in their job should be no less important than their family life	1	2	3	4	5
30	The professional satisfaction of a married woman is a success of her husband	1	2	3	4	5
31	It is preferable that the man will take care of the livelihood and succeed in his work and the woman will take care of the house and the children	1	2	3	4	5

The traits characterizing the successful teacher

Below are several statements relating to diverse areas. Please read carefully each of the statements, and grade the most important characteristics for the successful teacher.

The most important characterization will receive a value of 5 and the least important characterization will receive a value of 1.

No.	Statements	Not important at all	Not important	Partially important	important	The most important
1	Enthusiastic	1	2	3	4	5
2	Creates a non-authoritative democratic environment	1	2	3	4	5
3	Has a sense of humor	1	2	3	4	5
4	Forms good relationship with children	1	2	3	4	5
5	Dedicated to teaching	1	2	3	4	5
6	Has a vast knowledge in all the area he/she teaches	1	2	3	4	5
7	Maintains positive relationship with the staff	1	2	3	4	5
8	Behaves according to professional ethics	1	2	3	4	5
9	Participates in professional extended studies	1	2	3	4	5
10	Helps the pupils' development and cognitive abilities	1	2	3	4	5
11	Able to adjust to changes according to circumstances	1	2	3	4	5
12	Organizes the lesson well [time, content, equipment].	1	2	3	4	5
13	Used diverse teaching styles to motivate pupils	1	2	3	4	5
14	Uses test examining specific goals	1	2	3	4	5
15	Incorporates ideas and opinions of pupils	1	2	3	4	5
16	Gives pupils positive incentives	1	2	3	4	5

17	Responds sensitively to needs and emotions of pupils	1	2	3	4	5
18	Creates positive relations and effective communication with staff and parents	1	2	3	4	5
19	Develops and maintains relationship with the pupils	1	2	3	4	5
20	Help pupils to develop self-awareness and positive self-image	1	2	3	4	5
21	Keeps discipline in class	1	2	3	4	5
22	Treats pupils strictly and fairly	1	2	3	4	5
23	Insures pupils' safety	1	2	3	4	
24	Creates positive learning environment	1	2	3	4	5
25	Functions effectively regarding non-teaching tasks, like checking presence, preparing ceremonies, etc.	1	2	3	4	5

Perception of the teaching profession

Below are several statements relating to diverse areas. Please grade them giving 5 to the statement you agree most and 1 to the statement you completely disagree.

No.	Statement	Absolutely disagree	disagree	Partially agree	Agree	Most certainly agree
1	Licensing tests should be introduced in teaching just as for lawyers and accountants	1	2	3	4	5
2	The job of the teacher should be increased to 40 hours per week, [so his/her entire work should be performed	1	2	3	4	5

	at school] and increase his/her salary accordingly					
3	Teaching is a hard profession	1	2	3	4	5
4	The parents' involvement in school should be increased	1	2	3	4	5
5	The teachers do not work much, they have comfortable working hours and many vacations	1	2	3	4	5
6	The teaching profession is based most on natural aptitude and intuition rather than learning and training	1	2	3	4	5
7	Pup0ils with special needs should be integrated within the regular education	1	2	3	4	5
8	A salary stag must be instituted as a condition for obtaining a work permit	1	2	3	4	5
9	Equal weight should be given to theoretical studies and practical experience	1	2	3	4	5
10	More weight should be given to theoretical studies compared to practical experience	1	2	3	4	5
11	More weight should be given to practical experience compared to theoretical studies	1	2	3	4	5
12	A teaching job allows advancement	1	2	3	4	5
13	A teaching job constitutes a mission	1	2	3	4	5
14	The teaching allows professional	1	2	3	4	5

	autonomy					
15	The teaching provides job security	1	2	3	4	5
16	Teaching requires long-term investment	1	2	3	4	5
17	Teaching allows changing the educational system	1	2	3	4	5
18	The work in teaching allows the definition of clear lines of essence	1	2	3	4	5
19	Teaching requires constant specialization throughout the life of the profession	1	2	3	4	5
20	Teaching facilitates expressing love of the children	1	2	3	4	5
21	If it was possible to re-decide to study teaching, I would surely repeat the same decision	1	2	3	4	5
22	If your friends had told you that they are interested in studying teaching, you surely would warmly recommend	1	2	3	4	5
23	I think that I will continue to be teaching for the rest of my life	1	2	3	4	5

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THE EFFECT OF THE USAGE OF ORIGAMI ON THE PERCEPTION OF THE AREA OF QUADRANGULAR SHAPES

Abstract

The aim of this study was to examine the effect of using the origami method in geometry teaching, on the perception and understanding of the concept “area” of geometric shapes by pupils of 8th grade in schools of the Arabic sector in Israel.

This study is based on a quantitative research; supported by small-scale combined study of qualitative and action research, the researcher sampled 30 students of 8th grade in schools of the Arabic sector in Israel. The 30 participants were asked to answer questions presented in two different questionnaire of the same level. Each of these questionnaires contained 4 questions relating to areas of diverse quadrangular shapes. The first questionnaire was given to the participants to fill out at the beginning of the study. After collecting the filled questionnaires, the students were given 5 lessons in which they learned origami, and how to use it in geometry. After these lessons, the participants were given the second questionnaire in order to find out if the use of the origami method affected their perception and calculation of the concept “area” of quadrangular shapes.

The study results show that after the training in the origami method and learning to use a dynamic computer program, the students shown better recognition of diverse geometric shapes and their properties, which indicates that the origami method and the use of dynamic computer program is beneficial and helps students in identification of geometric shapes and recognition of their properties. During the origami learning course meets between the researcher and the participants, the students revealed great enthusiasm of the Origami method; they liked to calculate areas by means of folding paper. It was also found that it was easy to teach the students how to calculate quadrangular shapes by means of using paper folds.

Introduction

The National Council of Math Teachers [NCTM] emphasizes the importance of the commitment to excellence in teaching and learning Math, and presented an ambitious vision for a rigorous and high-quality mathematical learning environment, with clear comprehensive aim to raise discussions and increase efforts to improve Math education and mathematical skills to pupils from kindergarten to 12th grade [NCTM, 2000]. Geometry is one of the most difficult area in mathematics, it is considered as a unique among the mathematical subjects because it is perceived as the bridge between mathematics and the world surrounding us [Boakes, 2006].

When children learn geometry, they learn to discover, imagine and represent concepts and attributes of geometric formations in this physical world [Cipoletti & Wilson, 2004]. Therefore, teaching pupils geometric concepts is an essential part of their mathematical development.

There are various methods to teach Geometry. One of these methods is using Origami. The term Origametria TM formed by combining the two words origami and geometry, was created by the Israeli Origami Center [IOC], to describe a novel innovative program to teach geometry in the educational program by means of origami. By 2009, the program was taught experimentally in 70 schools in Israel including schools from the Jewish, the Arab and the Christian sectors. By that time, the IOC already trained 40 math teachers to teach geometry using this program. [Golan & Jacobson, 2009].

This article presents a quantitative study. (Supported by small-scale combined study of qualitative and action research). The aim of the study was to find out if teaching by means of using origami will benefit and improve pupils' understanding and perception of the subject matter and help them to calculate areas of quadrangular shapes.

The participants were 30 pupils of 8th grade sampled from a school in the Arabic sector in Israel. The study had been conducted in three stages:

Stage 1 – the participants were given a questionnaire containing 4 problems relating to areas of various quadrangular shapes.

Stage 2 – the participants were given 5 lessons in which they learned to use origami to solve problems in geometry.

Stage 3 – the participants were given another, different questionnaire containing 4 geometry problems relating to finding areas of quadrangular shapes. The problems in both questionnaires were of the same level.

Within the framework of the study, the researcher had conducted another small-scale qualitative study with three pupils by means of questionnaire that examined pupils' ability to identify geometric shapes and their properties. This study had been combined with an action study in which the researcher, with the assistance of additional colleagues taught the participants few lessons in origami, after which, the participants were asked again to identify geometrical forms and their properties, to find out if and to what extent, the lessons in origami improved their mathematic and geometric thinking ability.

The study is constructed as follows: introduction, three chapters and summation.

The first chapter deals with definition of the concept “area”, and the difficulties in understanding it. Then we shall define the origami method and its uses, and at last we shall refer to the advantages of using origami for perception and calculation of quadrangular shapes.

The second chapter describes the research population, will define research method and research tool, and describe the questionnaire used in this research.

The third chapter presents the research findings and discuss them.

Chapter 1 – Theoretical Background

This chapter will contain a definition of the concept area, and present the difficulties in learning it. Later I will present and explain the concept geometry, and I will describe methods of teaching and learning area of geometric shapes and present the origami method and the way it is used in teaching geometry.

Geometry in kindergarten and school

Advance in thinking level largely depends on educational approach and the teaching methods implemented in geometry class. Therefore, the knowledge and awareness of the teacher about the child thinking level is imperative, since such knowledge can guide the teacher in the choice of

learning opportunities for the child [Clements & Sarama, 2000]. According to papers published by the latter, the ideas of children of shapes stabilize by the age of 6. Their studies [2000] revealed that from preschool to elementary school children learn very little on shapes, and claim that a misconception of children at the age of 6 will most likely continue to exist in the child even in my later years in later years, regardless of what the teacher and the teaching book will say. In light of this finding, the researchers emphasize the importance of engaging in geometry at tender age and claim that even very young children can learn to relate and Sort shapes with precision and describe their characteristic attributes.

Reference to geometric shapes, as early as in kindergarten, could advance the children geometric knowledge to move from functioning at the visual level – “it looks like: “to functioning at the descriptive level: “it is not a triangle because it has a non-straight slope” [Tirosh & Tsamir, 2008].

Development of geometric thinking and thinking levels

Geometric thinking of children is changing with their maturation and development; geometric thinking develops in successive stages as the level of complexity of thinking increases from one stage to the stage following. Geometry learned in school presented in similar axiomatic form, assumes that pupils think in formal-deductive level, but in fact, most pupils lack preliminary necessary understanding of geometry. This deficiency creates a gap between their thinking level and the level required from them to learn the geometric content they are expected to learn [Keiser, Klee & Fitch, 2003].

In addition to the above, many pupils lack the required geometric words to articulate what they see, think or mean [Keiser, Klee & Fitch, 2003]. According to Van-Heile [1987], geometric thinking of children develops in a number of stages described as geometric thinking levels:

1). **Visual level** – at this stage children judge shapes by their looks and their similarity to other shapes. They might identify quadrangular with a convex side as a triangle because it looks like a hat of a witch, or rectangle because it looks like a box. This thinking level is visual but not verbal [Pitkin & Liebenberg, 2018].

2). **Analysis level** – at this stage, children analyze shapes based on their characteristics and properties [Van Heile, 1999]. They begin to consider the shape’s parts and unique properties, although they might use an informal language to describe it. At this level, the shapes are the carrier of their properties: a shape is no longer judged because it looks like something but because it has specific properties. For example: an equilateral triangle has properties like: 3 sides, all the sides are equal, and reflecting and rotation symmetry. At this stage, the language is important to describe shape, but theoretically, the shapes are not yet organized in a logic order, therefore, an equilateral triangle does not necessarily have equal angles. [Koester, 2003].

3). **Abstraction level** – at this stage, children are able to generalize internal connections in properties of a given shape or in different shapes. [Van Heile, 1999]. At this stage, the children analyze the shape in terms of its properties and identify the connection between these properties. They are able to understand and develop abstract definitions and sort shapes according to hierarchy. For example, they know that a square is also a parallelogram, because it is a quadrangular with two pairs of parallel opposite sides. [Koester, 2003]. The children use properties they already know to phrase definitions for squares, rectangles and equilateral triangles, to justify relations like an explanation why all squares are also rectangles or why the sum of all the angles of a triangle must be 180° . Meaning, the role of axioms, definitions and theorems, however, at this stage the order of the calculation is different and the deduction is reached in a different stage. [Van Heile, 1999].

4). **Deduction level** – the pupils are able to build proofs, understand the role of axioms and definitions, and they should also understand the meaning of: “sufficient necessary condition” [Van Heile, 1999].” The pupil understands the meaning of deduction and the roles of basic terms, definitions, axioms, theorems and proofs. At this stage he/she can use assumptions to prove theorems” [Koester, 2003].

5). The last level is the **rigor/accuracy level** “At this stage the pupil understands the formal aspect of geometry, his/her understanding does not depend on the looks of the shape and he/she is able to understand the existence of alternative geometry” [Van Heile, 1999]. “At this level the pupil understands the importance of accuracy; he/she can investigate the consequences arising from the substitution of one set of axioms with another. He/she knows and can compare various strategies of proof, and can discover new proof methods and theorems.” [Koester, 2003].

Van Heile had pointed out that the development stages of geometric thinking are successive and a child must go through all the stages. An interesting point that he emphasizes is that these stages are not age dependent as teaching and geometric experience impacts are more important than age. Which means that: “When embarking on developing geometric thinking, the teaching methods and their adaptability to the pupil’s thinking level are imperative. [Lenneberg & Pitkin, 2010].

Studies show that the teaching method affects advancement of delaying of pupils’ thinking development. It had been found that incorporating research tasks into teaching mathematics may contribute to the development of pupils' mathematical thinking and even advance teaching in general [Mountwitten, 2004]. Therefore, teaching should include a sequence of 5 stages activities:

1. **Research stage** – in which the pupil is able to investigate and discover certain characteristic structures;
2. **Direct orientation** – in which the tasks are presented in a way that the characterized structures appear in the definition.
3. **The explanation stage** – in which the teacher presents and exercises with the pupils the terminology, in order to encourage the pupils to use it in conversations and tasks.
4. **Free orientation** – the pupils are able to perform tasks in various ways that enable them to become better skilled than they were.
5. **Integration** – at this stage the pupils are given the opportunities group together everything they may have learned, perhaps by creating an activity of their own clues. [Mountwitten, 2004].

Development of Geometric thinking with the help of paper folds

Pupils are familiar with activities relating to paper folds since preschool. Engagement in paper folding is considered a pleasing and surprising and its products are considered beautiful. Paper folding and engagement in making them is also considered important since because it enables making, observing, appreciation of the connections, product analysis, understanding the mathematic principles, planning ability etc. It is also providing the pupils the opportunity to use the mathematical language and develop geometric thinking [Lev-Zamir, 2005].

“Each stage of the folding is a study of the chosen geometric subject until the final product”

“Studies indicate that development of children knowledge of shapes and their properties exists due to activities with mosaics as well as additional activities such as folding paper, cutting and painting that enrich the children’s visual structure [Kalmar, Golan & Oberman, 2015].

Two educational methods are used incorporating origami to develop pupils’ special insights: one deals with strengthening geometric intuitions of children by paper folding and the other is focusing on teachers’ support by means of audio program that includes usage of animation that helps them to understand the way in which children can be taught geometric shapes. The program also includes clear guidelines and rules. It is important to incorporate computer in constructing geometric shapes, but it is also important to teach geometric concepts by means of illustration; demonstrating by means of free construction according to needs, and moving the shapes in the space. Furthermore, learning and developing self-awareness sometimes called reflection, is also important since it contributes to assimilation of the geometric concepts and strengthens the ability to imagine the results of the shapes’ transformations. [Kalmar, Golan & Oberman, 2015].

Defining the concept “area” and the difficulties to understand it

Area refers to measurement of two-dimensional space within a defined boundary. [Van-De Valle, Karp & Bay-Williams, 2012]. Measurement of an area is a process of giving a numeral value to a given surface. however, regardless of the fact that the measurement units are essential to this process, they are neglected during Math teaching where the focus is only on the numerical result. Thus, the special properties of the area is not given importance and the measurement process gets a meaning of numerical manipulation [Kordaki & Potari, 2002].

Several studies found various difficulties among pupils, in understanding the concept “area” and measuring it. These difficulties arise from the very properties that the concept of area has. Many pupils use linear units to measure area instead of quadratic units, believing that multiplication of the sides’ lengths duplicates its area. According to Baturu & Nason [1996], the concept “area” should be referred to from two different aspects: static and dynamic. The formal procedure for calculating area of a quadrangle, requires receiving of two length measures and use them to

calculate the area in a formula whose result is an area unit. The claim is that if the pupils fail to understand the concept base of the formulas, they have difficulties to include the processes they had learned and tend to memorize the formulas. [Outhred & Mitchelmore, 2000].

The Origami Method – Definition and Importance

Origami is a Japanese paper folding art. When used in education, origami has a significant mathematic potential, especially in geometry [Boakes, 2009; Tubis, 2009;]. According to Wares, [Cornelius & Wares, 2011], origami is the bridge between nature and Math. Cagle [2009] claims that the teaching of origami improves the use of mathematic language, while Arici & Aslan-Tutak [2009], claim that origami can be used to support the pupils' understanding of geometry. Origami is also used in teaching of algebra, fractions, appearance in space, trigonometry, etc. Georgeson, 2003]; Robichaux, & Rodrigeue, 2011] showed that origami produces effective mathematic abilities, such as the ability to solve mathematical problems, among pupils. Both pupils and teachers enjoy performing paper folding during math classes. [Fiol, Dasquens & Prat, 2011]. However, as Georgeson [2011] had observed “if the teacher does not make the connection between origami and mathematic, the use of origami in Math education is no more than an enjoyable activity”. To make the connection between origami and Math, the teacher must be trained for such teaching [Cipoletti & Wilson, 2004]. Cakmak, Isiksal & Koc, [2014], examined how teaching origami based mathematic affects the pupils' basic spatial ability and shown that teaching origami based mathematic significantly increased the spatial ability marks of primary school pupils. Arici & Aslan-Tutak [2015] found that using origami activities in geometry lessons improved the academic achievements of high school pupils in geometry.

A traditional origami begins with a square sheet of paper, usually white on one side and of different color on the other. The origami maker makes a sequence of “hill” and “valley” folds, and creates a web of wrinkles that turn the paper into a colorful mosaic; and as fans of computerized graphics know, it is possible to do a lot with polygon's. Arik Demine, a computer scientist from Waterloo university, described some of the amazing polygons and polyhedral that could be created by means of origami, for example: it is possible to folds a paper sheet which is white on one side and black on the other to make a paper format of checkers board [Cipra, 2001].

The Origami Tradition

According to the tradition of the Shinto faith, the crane has a special importance in paper folds; since the legend claims that folding a thousand cranes allows the fulfillment of a wish. The crane symbolizes success, health and the fulfillment of wishes. In the 20th century, in addition to tradition, folding of a crane received a meaning of peace following a life story of a 12 years old girl named Sadco Seski who survived the Hiroshima atom bombing. On 1855 Sadco contracted leukemia, and decided to fold a thousand cranes for world peace. She managed to fold almost 600 cranes before she succumbed to the disease and died. Her life story strengthened the paper folding tradition of crane, and became the symbol of peace movements throughout the world. Her life story was published after her death and she became a popular national heroin of Japan [Lang, 2019].

The Origami Paper

The type of the paper used for origami is important since it has a significant impact on the looks and quality of the folding. A regular paper used in Xerox machines is not suitable for origami because it contains a small number of layers that allow only very simple folding. A square meter sheet of standard Xerox paper weights between 70 to 90 gram. So to get more complex folding it is customary to use a thinner paper that weights between 50 to 60 gram per square meter. In addition, it is also customary to use a thicker paper weighting about 100 g' per meter for "wet folding" that gives the folding a rounded appearance and when it dries, it becomes stable and firm. Another type of paper used for origami is a thin paper glued to a very thin aluminum foil that keeps the folding form longer and gives them stability and sustainability. Long paper fibers contained in a high quality paper give it strength and flexibility in folding. To make numerous layers of folding the papers must be very thin and ultra-compressible [Gueta, 2008].

Paper folding in Japan has an important role; it is used in construction of inner walls in houses, and as raw material for fans and calligraphy. The Shintu tradition also used the origami art to make "nushi"- paper folding in white with dried snails or meat strips glued upon, which were originally attached to presents as blessing for good luck. The "nushi" custom developed into a

higher level of complexity and ritual: until presents' wrapping required a professional who expertize in "tsutsumi" – ritual presents' wrapping. [Gueta, 2008].

The Principles of Origami

The folding principles, first developed by Friedrich Froebel (1852-1782), are taught today in several academic courses, mostly in courses of various types of design, like fashion design, items design, etc. Paper folding is also used in engineering, architecture, mathematics, chemistry and biology. Paul Jackson, an origami teacher in Shenkar college, published an article emphasizing origami as an educational auxiliary tool. An academic study carried in Russia's Rostov University determined that according to most scientific experiments, the status of origami as an educational auxiliary tool became very acceptable. A study conducted in a psychiatry ward by Yuri Shumacov indicated that paper folding activate both right and left hemisphere of the brain equally, in both genders. This trait of activating both hemispheres simultaneously is unique among learning subjects, as other subjects, like Math or Gym, prefer activating one, or mostly one of the hemispheres. Shumacov's study is considered very useful in science. According to the Origami Israeli Center, paper folding is a preferred class activity [Lang, 2019].

Education and Teaching with the help of Origami

In Japan, and many other countries, origami folding became a common teaching aid in teaching and education at large in all level, from preschool to academe. The first usage of origami as teaching aid was made in the 18th century in France and Germany, that used paper folds of the Spanish type. Froebel, who established a global net for children, used the paper folding of the Japanese origami in order to develop creativity among children he educated. Since the end of the 19th century t following many mathematical studies of paper folding, the use of origami culture was introduced also in geometry teaching in some high level educational institutions. For example, the university of Tokyo offers a number of Math courses based on mathematical calculations of paper folds [Mevorach, 2017].

The Mathematical Aspect of Origami

The mathematical base reflected by studies of origami paper folds was proven by the mathematician Horiaki Hozita. His version consists of six points of origin the origami model. Later, the mathematician Koshiro Hatori added a seventh point. After the publications of their studies the origami culture became a target of several Mathematic studies [Mendel-Levi, 2017].

The Origami art in Mathematic and Geometry

Creation of origami paper folds requires sensual processes. The origami culture, an ancient culture that originated in Japan, is expressed in two-dimensional and tri-dimensional geometry. Learning geometry with the aid of origami is called origametry. The base of the origami art is a sheet of paper that could be folded into several formations, from a cube form to ship or flower or in fact, almost anything. Paper folds can be used to learn various types of geometry, like analytic geometry, special geometry, Euclidean geometry, etc. Samples of origami models are used to demonstrate various geometry concepts in order to explain features properties and geometric shapes and to exercise geometric theorems [Mevorach, 2017].

The use of Origami in Geometry Learning

The use of the origami method in geometry in was introduced to the Israeli educational system on 1992, when the IOC – Israeli Origami Center began to teach an origami program in order to develop learning skills. The program was meant to empower self-esteem and achievement feeling, by development of learning skills such as: motoric skills, spatial perception, logic consecutive thinking, eye-hand coordination, focus and concentration, aesthetics, tri-dimensional perception and basic geometric principles. [Golan & Jackson, 2009].

The national council for mathematic teachers [1989] suggested the usage of everyday items such as paper to allow pupils to investigate geometric relationships and vocabulary. Paper folding and other hands on activities were found to increase the pupils' ability to communicate mathematically, and to encourage their understanding in mathematical concepts. Origami projects use regular everyday objects, combine geometric relationships, creates communication

opportunities, and produces aesthetic pleasing items to share with others, together with an opportunity to acquire knowledge bridging diverse cultures. The use of origami activities in-class facilitates opportunities for teacher-pupil communication, communication among pupils between pupils and enables pupils to communicate with the community in geometric language from school. Teachers can use origami activities for several diverse purposes; to improve their pupils' understanding of geometric terminology, to repeat the meaning of geometrical terms, to use geometric language for communication, to –provide a preliminary lesson to a specific geometry unit, to use precise geometric language, or engage their pupils in enjoying geometric activity [Cipoletti & Wilson, 2004].

Another important aspect of origami is the symmetry; thus, it is quite common that origami groups will unify or will be classified according to the symmetry type their complete products demonstrate. Reflection, turns and fixations which are all tightly connect to symmetry. Isometries are also created identical bodies when one given object model turns into the creation of several other identical objects that maintain area, angle measure and distance, classifying origami constructions by symmetry is also a way to present art from a mathematic view point that could easily be used in a class discussing symmetrical forms [Robichaux & Rodrigue, 2003].

computers can be used to study origami in depth and allow filed to create complex waves that otherwise could not be created. There are a number of computer programs such as TreeMaker and others, that help the production of sophisticated origami designs by means of geometric algorithms. These algorithms do not create actual origami objects, but they do help the artist to understand and figure out how to plan them. The plans allow transformation of mathematical images of the artists into real, physical objects. So in practice the artists only calculate the folding design of the final object by means of the algorithms required; nevertheless, the artist must implement the creative special folding [Jensen, 2007].

In many schools the academic subject geometry encounters difficulties in explaining tri-dimensional shapes. Too often, the pupils do not understand the subject matter, and the teachers must cope with teaching difficulties. A study that had been conducted among 3rd grade pupils to verify the improvement measure in the fields of motoric skills, memory and visual perception. The participants had been divided into 4 groups two experimental groups and two control groups: each of the experimental groups had been subdivided into two classes; one class received

conventional education and the other received therapeutic education. All the pupils in the experimental groups learned to build paper origami models

The control groups: the pupils in the first control group extended their previous school day by an additional lesson in which they learned to use computers. The second control group continued to learn according to their regular learning schedule.

The data gathered from this study revealed that the achievements of all the participants from all the groups had improved in most academic subjects, but there had been some difference: by percentage, the highest achievement was seen among pupils that were in experimental group that continued to learn according to the conventional schedule, while among pupils in the other three groups the best improvement was in the test of attention and concentration, as expected. The pupils in the therapeutic group also improved their achievements, but to a lesser degree than participants that were in the other three groups. Learning the subject of geometry with the help of using the origami art form makes the subject a pleasing more interesting experience for both pupils and teachers. [Mendel-Levi, 2017].

The use of origami can lead to impressive achievement of pupils in geometry, however, everything depends on the teacher; whether or not his/her knowledge of origami is sufficient, it the teaching method insures that the pupils understand and develop their knowledge, and if the new skill had increased the pupils' self-confidence. In origametry, most of the folding taught create forms of flowers and animals rather than geometric shapes like pyramids, cubes, etc. this is due to the fact that children like and connect better to models from the animal world, whose making elevates their motivation. Instead of learning how to fold a cube, the teachers teach how to fold a fox. Two-dimensional geometry is based on sides, angles, half-angles symmetry and sections. In pre-junior high grades, the pupils learn to fold tri-dimensional models because the best learning form is learning directly from the forms produced. [Sar-Avi, 2017].

The Purpose of This Study

To find out to what measure the origami method affects the perception of quadrangular shapes “area” among 8th grade pupils in schools of the Arabic sector in Israel.

The Research Question

To which extent the use of the origami method affects the perception of the concept quadrangular area among 8th grade pupils

2. Methodology

2.1. Research Method

This study is a combination of a quantitative and qualitative research; in the quantitative part we shall study and analyze the answers of the questions presented to the participants by means of questionnaires. In the qualitative part we shall follow the stages of the learning.

2.2. Research Population and Sample

The research participants were all 9th grade pupils in a junior-high school of the Arabic sector in Northern Israel, serving **120** pupils and employing **9** teachers. The participants had been selected to represent pupils of all levels: weak, average and strong, that have a previous knowledge on quadrangular' area learned in grade 8 and grade 9.

2.3. The Research Tools

a. Questionnaire - In the quantitative part of the study, we used two questionnaires [See appendix] of a similar level, each questionnaire contained 4 questions in geometry that examined the participants understanding of geometrical shapes and the impact of using origami paper folds on the matter.

b. Observation – used in the qualitative part of the study –recording the pupils' work, during the teaching of a learning unit in three stations of the course: at the first, second and third lessons. The recoding was done by audio- visual means.

c. Interviews – the participants were interviewed before and after their learning in order to test their progress; the interviews had been recorded in each of the meetings during the participants' engagement in origami.

2.4. Data Analysis - Data analysis was performed on both questionnaires answered before and after learning origami and how to use it in geometry, by T-test for dependent samples, to examine the difference in the results' averages.

The observations were analyzed by means of constant comparison.

2.5 The Research Process – before the intervention program we selected 30 8th grade pupils and tested their knowledge level of areas of the following geometric shapes: trapeze, parallelogram, rectangles and squares. During the intervention program, these pupils will attend all the regular learning schedule, and in addition they were given 5 lessons in the subject of origami and its usage in geometry. These additional lessons were given in consecutive 4 days. The study participants were given two different but of similar level questionnaires of 4 questions relating to quadrangular areas, before and after they had attended the program in which they learned geometry, mostly areas of geometric shapes, by means of paper folding.

2.6. – Observations – the 5 lessons, explaining the use of origami to understand the concept geometric shapes' "area" had been observed and recorded for reevaluation.

The lesson	Its purpose	Description of activities
The area of trapeze	To learn how to calculate trapeze area by means of paper folding	
The area of rectangle	To learn how to calculate rectangle area by means of paper folding	
The area of a square	To learn how to calculate square area by means of paper folding	
The area of parallelogram	To learn how to calculate parallelogram area by means of adding the areas of the parallelogram and the rectangle.	

The area of a triangle	To learn how to calculate triangle area by means of paper folding	
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3. Findings

3.1. Descriptive statistics

In this part of the study, we present the averages of the correct answers in both questionnaires, before and after the training in origami. Plate 1 shows the assemblage of averages for each question, before and after the training in origami.

Plate 1. – Averages for each question before and after the training in origami

Question	1	2	3	4
Average before	0.40	0.40	0.37	0.20
Average after	0.53	0.40	0.60	0.47

Analysis of plate 1 shows that after the origami training, the average of correct answers to the first question was higher [0.53] than the average of correct answers before the training in origami. [0.40] in the second question, the average of correct answers before and after the training did not change. In the third question, the average of the correct answers after the training was higher [0.60] than the average of correct answers [0.37] before the training. The average of the correct answers for the 4th question after the training was higher [0.47] than the average of the correct answers [0.20] before the training.

3.2. Deductive statistics

The research conjecture: the average of the correct answers after origami training will be higher than the average of the correct answers before it.

To find out if there are any differences in correct answers before and after training in origami we conducted t-test for paired samples.

Plate 2 presents the finding of the t-test for paired samples to the correct answers variable before and after the training in origami. [N= 30]

	Situation	N	Average	Standard deviation	T
Correct answers	Before training	30	1.33	0.88	-2.57**
	After training	30	2.0	1.58	

Plate 2 shows a distinctive difference between averages of correct answers before and after the training in origami. The finding show: [t (28) = -2.57; p< 0.01] thus, the average (m=1.33; sd = 0.88) of the correct answers after the training in origami is higher than the average of the correct answers (m = 2.0; sd = 1.58) before the training.

The conjecture was completely validated.

3.3. Sessions' description

- * The pupils were quiet and attentive. They show high interest in the lessons and were quite enthusiastic regarding the origami activity they were taught.
- * The researchers constantly walked among the students to see if they had any questions and to help those in need of help.
- * The participants attempted to use geometry teaching aids such as calculation ruler to calculate areas, and some even tried to use the area formula, but the researchers prevented them from using these aids.
- * Some of the participants did not understand the questions or what they were required to do. In such cases the researchers helped and explained to them the instructions in a clear and detailed mode.
- * The participants were eager to know how much they scored in the test (the questionnaire they filled up before the training).
- * During the first session, the researchers explained to the participants the term of origami, and explained to them how it is possible to calculate area of quadrangular shapes by means of the

origami paper folding method. “The pupils were very excited about the subject, they really wanted to start calculating areas by means of paper folding”.

* In the beginning of the origami lesson, the researcher gave an example of how to calculate an area of a square: first by means of the formula, and afterwards, to illustrate the method, by means of paper folding. In the second lessons, the participants were instructed how to calculate a rectangle area by means of origami.

* One of the participants, a girl named Erin, presented the researchers the way she calculated the rectangle’s area by means of paper folding. His presentation was absolutely correct, and the researchers felt pride and satisfaction since they realized that they succeeded in teaching how to use the origami method; as already in the second session, some of the pupils already know how to calculate areas by means of paper folds.

* At the beginning of the third session, the researchers repeat with the participants the calculation of the area of the rectangle by origami method learned in the second lesson and later into that session taught the participants how to calculate the area of trapeze by means of origami.

* In the fourth session the researchers taught the participants how to calculate the area of parallelogram by means of paper folding on the basis of the knowledge of how to calculate the area of a trapeze.

* The last session included a second test to examine the efficiency of the lessons taught on the subject matter: calculating areas in the origami method.

3.4. Findings revealed by tests and interviews

This chapter presents the findings of the small-scale [three participants] qualitative test performed at the beginning of the academic year. The test included personal interviews and a questionnaire that contained questions about the following geometrical shapes: triangle, quadrangle, rhombus, square, symmetry and a right angle [90⁰]. The three participants were Yihye Abd-Al Fatch, Yasser Mursi and Ibrahim Hathut. It also presents the progress of the learning processes of these participants after they learned to identify the given shapes by means of origami and also, by means of dynamic computer program. The research findings presented in this chapters are presented as is, without detailed explanations and without discussion or

comparison to [similar or different] findings in the literature. At the beginning there is a presentation of the participants' scores and the levels they achieved by quantitative tools before the interview followed by presentation of their progress by means of content analysis.

- **Tests' analysis**

Plate 3 presents the participants' achievements according to levels before they learned to identify properties of the following geometric shapes: triangle, quadrangle, rhombus, square rectangle, and examination of their ability to identify symmetry and right angle.

Plate 3. - levels of geometric thinking of the participants before the they learned the above mentioned material

Subject	Yihye	Yasser	Ibrahim
Triangle	1	2	2
Quadrangle	1	1	2
Square	1	2	2
Rectangle	1	2	2
Right angle	1	1	1
Symmetry	1	1	1
Rhombus	1	1	1

- A mark of 1 indicates level one, which means that the pupils is able to identify the shapes only by their appearance, mark two indicates level two, which means that the pupils is able to identify shapes by their appearance and by their geometric properties as well.

The findings presented in plate 3 show that before the additional learning process started, the pupil **Yasser** was in level 1 regarding the shapes: quadrangle, right angle, symmetry line and rhombus, which he identified only by their appearance, and in level 2 regarding the shapes: triangle, square and rectangle which he could identify by appearance and also by their geometric properties. The pupil **Ibrahim** was in level 1 regarding the shapes of right angle, symmetry line and rhombus which he succeeded to identify only by appearance and in level 2, regarding the

shapes: triangle square rectangle and quadrangle by appearance and by properties, while the pupil **Yihye** was in level 1 regarding all the shapes, since he was able to identify all of them only by appearance and none by properties.

Plate 4 presents the thinking level percentage of the three participants calculated by the test they took and submitted before the beginning of the additional learning process.

Plate 4: thinking level percentage of the three participants, calculated by the preliminary test

Subject	Yihye	Yasser	Ibrahim
Triangle	56	73	100
Quadrangle	4	10	100
Square	40	60	80
Rectangle	45	65	77
Right angle [90 ⁰]	25	50	100
Symmetry	33	18	77
Rhombus	75	45	75

The data presented in plate 4 indicates the pupil Yihye has significant difficulties in identifying shapes by their geometric properties, the pupil Ibrahim succeeded in identifying all the shapes by their properties, and the pupils Yasser succeeded to identify by properties only the shapes of: Triangle, Square and rectangle, while the other shapes: quadrangle, right angle, symmetry and rhombus he could identify only by appearance.

Interviews analysis

- **Ibrahim:**

Learning development regarding triangles: Ibrahim proved to be very strong regarding the subject of triangle. He was willing to participate in the study and truly enjoyed the paper folding activity. He had no difficulties or technical weaknesses with the materials, and no problems to

cope with the properties of the triangle. His exposure to paper folding in my lessons did not really affect his knowledge and ability to identify the triangle's properties, since he had mastered them before the study.

The learning development regarding quadrangular: rectangle, quadrangle, square and rhombus: Ibrahim knows how to identify the properties of all the quadrangular shapes before the extra learning. The learning only strengthened his ability to identify diverse quadrangular, especially regarding the rhombus whose properties he had difficulties to identify before the extra learning. This pupil was apt and could easily follow the folding instructions. Thus, he had no problems to identify the sides, the parietals, slopes, angles and reflection line.

The learning development regarding the subject of reflection line: Origametry – regardless of the fact that Ibrahim knew the reflection line well before the extra learning, he wanted to participate in this study because he wanted to investigate and learn new skill, especially when he realized that he enjoyed this new activity. He was also quite competitive regarding the discussion questions. Ibrahim had no technical and no comprehension difficulties with the geometry context. He was apt, had no problems to follow folding instructions and identified slopes, parietals/vertexes, angles and reflection line.

Ten fingers: Ibrahim was not that enthusiastic about the activity, but he was a willing participants and answered the questions correctly. It is important to point out that he is a competitive child who likes learning and likes winning by answering all the questions correctly. I recognized no technical or understanding difficulties; Ibrahim already knew what is a reflection line and how it affects the shapes. When he sees a symmetrical shape, he knows that it has a reflection line, and he also knows that not all shapes have a reflection line.

- **Yasser**

Learning development regarding a triangle Yasser, similarly to Ibrahim could easily identify a triangle shape. He was a willing, motivated participant, since he really enjoyed the paper folding activity. He shown understanding when answered the questions. Yasser is a very competitive pupil. He had no technical problems and knew how to cope well with the properties of the triangle. Although he had previous knowledge, I have no doubt that after the learning of

paper folding he identified the properties of triangle, for example: I asked him what are the properties of a triangle and he answered that it has three slopes and three angles.

The learning development regarding quadrangular: rectangle, quadrangle, square and rhombus: before the extra learning, Yasser could not identify the properties of some of the quadrangular, such as the quadrangle and the rhombus. But due to his strong willingness to learn and the several questions he asked during the learning, he shown a significant progress, as in addition to his previous knowledge, he learned well how to identify the properties of the quadrangle and rhombus.

The learning development regarding the subject of reflection line: Origametry: Yasser identified the reflection line and had no technical or other difficulties to understand geometry regarding the reflection-line related activity. He shown plenty of motivation to investigate and learn.

Ten fingers: he was a willing participant regardless the fact that he was not that enthusiastic, because he was motivated to learn new things and to investigate the shapes. He is also a rather competitive individual, like Ibrahim, when we arrived at this activity he already knew what is a reflection-line and what it does to the shape.

- **Yihye**

Learning development regarding a triangle: Yihye is a pupil that has significant difficulties in recognizing geometric shapes. Before and after learning origami he identified a triangle only by appearance, But regardless of his difficulties, he participated willingly and demonstrated high motivation to learn the new materials. Unfortunately, even after the extra learning, he was unable to understand the triangle's properties. In addition to these difficulties, he struggled with technical difficulties in paper folding and never learned to master "Traveling finger". He was too slow to comprehend, and still has difficulties in identifying a triangle.

The learning development regarding quadrangular: rectangle, quadrangle, square and rhombus: Yihye was also weak regarding the identification of quadrangular properties. He did not benefit from the extra learning and regardless of his willingness, he still fails to identify them.

The learning development regarding the subject of reflection line: the pupil had participated most willingly, he wanted to learn, but he had technical difficulties in folding making, because he could not master the technique of “traveling finger” on the slopes. [I also found out that he had difficulties to understand geometry. For example: he had difficulty in folding the pentagonal parietal/vertex to the opposite slope as marked in the animation. This was one of the difficulties that he had during the activity in understanding the subject matter. It is important to point out that this pupil was less motivated and slower compared to the other two participants.

Ten Fingers: Yihye participated willingly in the activity, and appeared quite motivated, it seems that he really likes learning new things, even though his answers were not always correct. He has some technical difficulties (for example: today he struggled to control the computer’s mouse), and sometimes in understanding the subject matter. Sometimes he also demonstrates a certain apathy.

Discussion and Summation

Origami is a delicate handcraft incorporating sophisticated thinking and a lot of planning, which are often used as therapeutic tools. These properties brought the use of origami to psychiatric hospitals and in special education schools, where it is used to help pupils with various deficiencies. For the same reason it is also used in rehabilitation clinics to help rehabilitate fine motor skills in accident victims. The type of paper used for origami is important because it significantly affect the looks and the quality of the folding. Creating artistic paper folding – origami - requires sensual processes. The origami culture is reflected in two dimensional and tri-dimensional geometries. Learning geometry by means of origami is called: Origametry. Various reports show that in many schools that geometry teachers had difficulties to explain the geometric features and principles of tri-dimensional forms, due to the fact that pupils have difficulties in understanding the subject matter, situation improved dramatically when geometry teaching incorporated origametry.

The main goal of Center for Origami Learnings is not just teaching another art form. The purpose of its main use in education is to strengthen the self-confidence of the pupil, enhance his/her self-image and return his/her self-esteem.

The aim of this study was to find out to which extent the use of origami method in geometry, effects on the perception of quadrangular shapes' area, of 8th grade pupils in schools of the Israeli Arabic sector. For this purpose, we had selected a sample of 30 8th grade pupils of the Israeli Arabic sector, and asked to fulfil a questionnaire containing 4 problems relating to areas and shapes of quadrangular. After collecting the questionnaires with their answers, the participants were given a 5 lessons course – one lesson a day at the end of a regular school day - in origami, including learning how to use it to solve such problems. After the 5 lesson course they were given another 4 questions questionnaire of similar level, to see if the origami method indeed benefitted their perception of the concept: “Area” of quadrangular shapes and its calculation.

To test the research question we had performed a T test for dependent samples, to the results in both questionnaires, the one the pupils answered before the course and the one they answered after. The research findings indicate that after the training in origami, the pupils succeeded to answer correctly a higher percentage of the problems, compared to their achievements before the training. This finding supports the assumption that the origami method is effective and helps pupils to perceive quadrangular shapes more correctly.

The research findings also show that after the training in origami and in use of dynamic computer program, the pupil's ability to identify geometric shapes and their properties had improved.

This finding is in line with the findings of Lev-Zamir [2005] who found that engagement of children in tender age in paper folding is very important since it enables the recognition/identification of various geometric shapes, understanding the relationships between them and recognize their features, because by doing so they perceive the shapes visually.

Kalmar, Golan & Oberman [2015], arrived at a similar conclusion, which strengthens the idea that children knowledge regarding shapes and their properties benefits from paper folding activities that enriches children's visual construction.

During the researcher's sessions with the participants, she felt great enthusiasm among the pupils regarding the engagement in origami, they really liked to calculate areas by means of paper folding. She also found that it was relatively easy to teach the pupils how to calculate quadrangular shapes' areas by means of paper folding. This finding is also supported by the

study of Lev-Zamir [2005] which showed that engaging in paper folding activities is considered a fun and surprising activity whose product is considered an item of beauty.

In light of the findings of this study we recommend teachers of calculus and geometry in Junior high schools, especially in grade 8, to use the origami method during their teaching the concept “area”. We also recommend teachers to examine the use of origami method in other areas of geometry.

Research limitations:

This study had two major limitations:

- a. The first limitation is the sample size, which is relatively small and therefore statistically does not represent the entire pupils of 8th grade. Therefore, to get a statistically more reliable accurate knowledge, a similar study with a much larger sample should be conducted.
- b. The second limitation it was conducted in time of a global health crisis, the Corona pandemic. A fact that made it very difficult to select participants and distribute the questionnaires, since the schools were closed due to the curfew declared by the government. Thus, a similar larger scale study should be carried in the future in normative calmer times.

Attachments

A working sheet

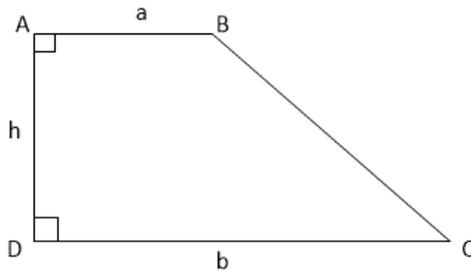
Quadrangular shapes areas

8th grade

Date: 10/06/2022

Mark the correct answer:

- a. The trapeze below has been divided into a rectangle and a triangle, which of the two has a larger area?



$a = 8\text{cm},$

$b = 12\text{cm},$

$h = 6\text{cm}.$

*rectangle	*triangle	*equal	*impossible to know
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- b. Enlarge a slope of a square by 5 cm and diminish the slope perpendicular to it by 5 cm. The result is a 200 cubic cm. What was the area of the original square?

*25 square cm	*200 square cm	*225 square cm	*impossible to know
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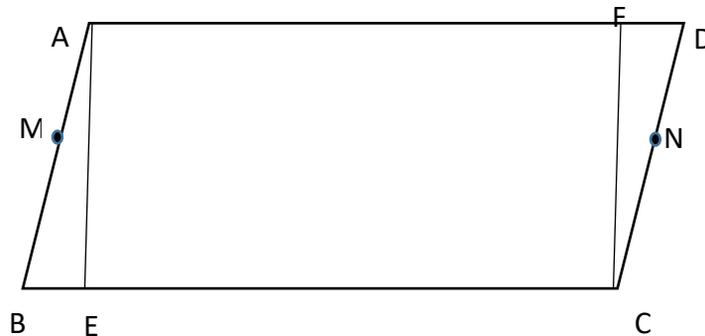
- b. The illustration shows an isosceles trapezoid– ABCD. The length of its diagonal slope is 13 cm. The perpendicular lines BE and AF are the heights of the trapeze and they divide the 21 cm base into 3 equal sections. The area of the trapeze is 84 square cm. How can the data help us find the area of the square ABEF? What is the ABEF square?



• 14	*49	*42	*impossible to know
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The quadrangle is a rectangle whose dimensions are 6X7 cm

- d. The quadrangle presented below is a parallelogram: ABCD. Slope AD is of 15 cm length and the section FD is of 5 cm length and the length of the parallelogram height is 12 cm. the illustration shows 2 points, M & N at mid-point of the two diagonal slopes CD and AB. What would be obtained if we would fold the parallelogram on the imaginary line connecting points M & N so point C will be on point F and point E will be on point A?



* Rectangle	• Triangle	• Square	8 impossible to know
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A working sheet

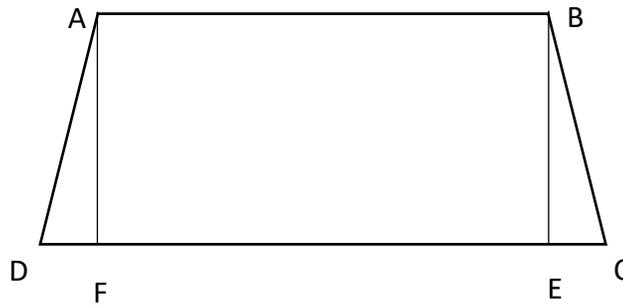
Quadrangular shapes areas

8th grade

Date: 18/06/2022

Choose the correct answer:

- a. The isosceles trapeze presented below: ABCD is divided into a rectangle and two triangles. Which has a larger area, the rectangle or the triangles when: $AB = 6 \text{ cm}$; $CD = 20 \text{ cm}$; $AF = 5 \text{ cm}$.



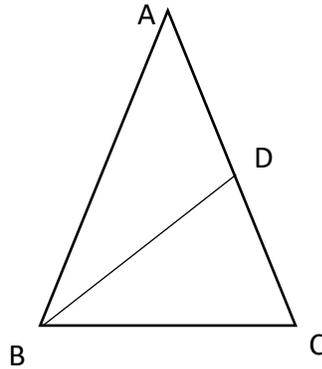
*The rectangle's area	*The triangles' area	*equal	* impossible to know
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- b. Enlarge a slope of a square in 7 cm, and diminish the perpendicular slope in 7 cm. the shape obtained is a rectangle whose area is 490 square cm. what was the area of the original square?

• 490	• 539	• 439	• Impossible to know
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- c. In an isosceles triangle ABC, the slope length is 13 cm and the base length is 10 cm, BD is a medial to slope BC.

What is the connection between the areas of the two triangles ABD & ACD?



*The area of the triangle ABD is larger	*The area of the triangle ACD is larger	*The areas of the two triangles: ABD & ACD is equal	*Impossible to know
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- d. In an unspecified triangle ABC, AD is a medial to slope BC. Are the areas of the triangles ACD & ABD equal? Please explain.

*Yes	*No	*impossible to know
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Dr. Wafiq Ali Hibi

A researcher in the field of pure mathematics, he completed his doctoral studies in the Department of Pure Mathematics, University of Haifa, in 2004, after solving a mathematical problem in the topology of metric spaces and graphical theories in isometric spaces, which was open for nearly fifty years.

Dr. Hibi worked as a lecturer at the University of Haifa for several years in the Department of Mathematics, the Department of Economics and the Department of Accounting and taught advanced mathematics courses in the various departments.

Full-time national instructor for teaching mathematics in the Arab sector and a general instructor in adult education.

Today he is a lecturer at Sakhnin College and serves as the head of the Department of Mathematics; In addition, we noted that the Council for Higher Education in Israel rates him as a senior lecturer.

He has published over forty mathematical papers published in world and local law journals, and has authored dozens of academic books in various mathematics disciplines. Also connects math textbooks for elementary, middle and high schools.

It should also be noted that he has an interest in various other fields of knowledge; in physics and English he is a member of the matriculation books, and in the Arabic language, he is a member of early childhood and elementary school textbooks, he is also a member of many books in literature and poetry.

Dr. Hibi recently began researching in the field of mathematics education and mathematics teaching, where he has published and continues to publish articles on the subject of teaching methods in mathematics for its various branches.