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Active and traditional teaching, self-image, and motivation in learning math among pupils with learning disabilities

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Abstract: In this, I examined the differences between two approaches for teaching math to pupils with learning disabilities: active teaching as opposed to traditional teaching, which engages pupils more directly in their own learning process and promotes collaborative learning, and traditional (frontal) teaching. The hypothesis is that active teaching will result in an improved self-image and the motivation to learn math than traditional teaching. Forty pupils with learning disabilities in special education classes at a conventional elementary school participated in the study. In two classes, an active teaching approach was used to teach math, and in the oeher two classes, a traditional approach was used. Our findings indicate that the self-image, motivation, and achievement of the pupils in the active teaching classes to learn math was higher than in the traditional classes. These results have implications for pupils with learning disabilities and other pupils learning math and other subjects and are relevant to curriculum teacher training programs.

Subjects: Development Communication; Development Studies; Education Studies; Curriculum Studies

Keywords: active teaching; traditional teaching; self-image; motivation; learning math; learning disabilities; special education

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PUBLIC INTEREST STATEMENT

This research examined the differences between two approaches for teaching math to pupils with learning disabilities: active teaching, which engages pupils more directly in their own learning process and promotes collaborative learning, and traditional (frontal) teaching. The hypothesis is that active teaching will result in an improved self-image and greater motivation to learn math than traditional teaching.

Forty pupils with learning disabilities in special education classes at a conventional elementary school participated in the study. In two classes, an active teaching approach was used to teach math, and in the oeher two classes, a traditional approach was used.

Our findings indicate that the self-image, motivation, and achievement of the pupils in the active teaching classes to learn math was higher than in the traditional classes. These results have implications for pupils with learning disabilities and other pupils learning math and other subjects and are relevant to curriculum teacher training programs.

1. Introduction

The subject of math is perceived as one of the most difficult to learn. The learning process is demanding because it requires dealing with a variety of subjects such as word problems, research assignments, representations of situations using illustrations, mathematical representation, comprehension of math terms, and the relationships among them. It is vitally important, therefore, to master the basics of math to understand subsequent, more advanced levels.

This research examined the differences between two approaches of teaching math in special education classes: active versus the traditional approach where the goal is to improve the self-image and the motivation to learn math of pupils with learning disabilities. The active teaching approach breaks new ground by advancing learning skills among pupils struggling with math; it helps develop confidence in their ability to understand the material taught during math lessons.

Active learning emphasizes the social interaction between the learners and at the same time reflects each pupil's active learning and personal progress. The approach calls for: the development of a flexible curriculum tailored to each pupil's ability, the organization of a varied range of curricular materials and the use of alternative methods of teaching. Self-image is a measure of the extent to which pupils believe that they can make progress in learning math despite the difficulties they may experience (Mimon, 2008). Motivation in learning is a pre-planned process that is consistently directed towards accomplishing a specific goal (Mimon, 2008; Pintrich & de Groot, 1990).

Based on existing research, active learning in math instruction will lead to an improvement of self-image and the motivation to learn math among pupils in special education classes (Berger & Karabenick, 2010; Fischbein, 1997; Mimon, 2008; Ritz & Ben Ari, 1994).

Not enough is known about the unique characteristics of various teaching methods and the correlation between these characteristics and the math achievement of pupils in special education. The aim of this is study is to define these methods more precisely and to examine their relative influence on the self-image and the motivation to learn math among pupils with learning disabilities in a conventional school setting.

Defining the differences between the characteristics of various teaching methods may allow for a better understanding of the correlation between school system elements and pupils' level of achievement and thus lead to more efficient planning of the curriculum.

2. Active teaching and traditional teaching

The active teaching approach assumes that a group of learners in class is heterogeneous and recognizes the existing differences among pupils in terms of their personal and academic skills. Furthermore, it emphasizes on the social structure of the group where the social relationship and the resulting dynamics among the pupils influence the learners and their personal development. It also emphasizes the differences among the pupils and the need to advance each pupil based on their individual level of skills. The characteristic of this approach is the flexible nature of the work in class and the need to create a rich and diverse learning environment to meet pupils' individual needs (Bishara, 2013).

A comprehensive approach to active teaching emphasizes five detailed dimensions: (1) Compassionate and warm relationships among learners and teaching participants in the school and its surrounding community. (2) The pupil's participation in self-directed independent study. (3) Development of a flexible curriculum adapted to the learner's needs. (4) The development and organization of various resources and materials in an engaging environment that stimulates learning and research. (5) Use of teaching methods and an array of social structures to allow for and develop all types of learning experiences (Kashti, Arieli, & Shalsky, 1997).

Different combinations of these five dimensions result in different rates of performance at various schools. At the same time, when all five dimensions are implemented in each of these teaching combination samples, the differences in performance are a function of the emphasis given to each of the dimensions, an emphasis which makes each of them unique (Azzalis, Sato, Mattos, Fonseca, & Giavarotti, 2009).

The traditional approach, as opposed to the various types of active approaches, relates to the group of learners as homogeneous. The teacher instructs everyone uniformly, with no regard to the differences between them. The curriculum structure is fixed and dictated to the pupils by those who create the standards. The use of illustrative methods to teach is minimal, a practice that challenges weaker pupils and makes it difficult for them to understand the material disregard of the efforts they put forth (Israeli, 2008; Nottingham & Verscheure, 2010).

As opposed to the traditional approach, the success of active teaching largely depends on the level of cooperation among all the stakeholders at school. They must all share the belief that the active approach is likely to advance the entire pupil population and provide a unique solution to each of the pupils based on their individual abilities (Agran & Wehmeyer, 1999).

3. Teaching approaches, self-image and motivation to learn math among pupils in special education

3.1. Math instruction: Approaches

Math is perceived as difficult and boring, and prone to failure during the very first years of formal education. The source of the difficulties and lack of interest is a result of the current teaching methods. Teaching math to pupils with learning disabilities is particularly challenging and the need to teach the content required by the Ministry of Education's curriculum puts an additional burden on teachers and pupils alike. It is necessary to use a wide range of illustrative means and customized teaching methods to alleviate pupils' frustration and provide an opportunity for them to advance (Bishara, 2005; Geary, 2004).

Math is also considered an important core subject in elementary schools in Israel. The required content is segmented by age group from first to sixth grade. The curricular goals are to acquire knowledge of algebra and geometry; the ability to apply the knowledge acquired in everyday life and in other subjects of study. Pupils should learn to solve word problems, cope with research tasks, and comprehend math concepts. Finally, pupils should become familiar with the language of mathematics and its proper application (Bishara, 2013).

Many countries, including the United States, put an emphasis on developing alternative approaches to teaching math. Over the years (beginning in 1920), five different approaches were developed: the Practice and Repetition approach (1920–1930) focused on arithmetic skills through memorizing; the Significant Teaching approach (1930–1950) which put the emphasis on developing an understanding of terms and procedures; the New Math approach (1960–1970) centered on the formal structural aspect of math; the Going Back to Basics approach (1970–1980), put the spotlight on learning to master basic skills; and finally, the Problem Solving approach (1980–1990) with its attempt to develop the learner's ability to describe a problem and then solve it using a mathematical model.

The need to change the teaching approach so often was based on the level of dissatisfaction with pupils' achievements. Parents also complained that the subject was difficult to deal with. This forced developers and teachers to vary math teaching approaches and to use new educational technologies in the process in an effort to make learning easier, encourage the pupils and advance their achievements (Fischbein, 1997; Kashti et al., 1997).

3.2. Self-image

There are three central approaches to defining the term self-image. The dynamic approach, which perceives the self as a progressive process of development; the humanistic approach, which emphasizes environmental impact on personal growth; and the social-cognitive approach which considers the self as an object of awareness (Throndsen, 2011).

Self-image, as it relates to math, is defined as the degree to which teachers believe their teaching approach has a positive impact on their students' achievements and the extent to which pupils believe that they can advance independently in learning math despite the various difficulties.

Research indicates that there is a correlation between teaching approaches, self-image and pupils' achievements. Findings also indicate that teachers who innovate their teaching approach used a more positive strategy to encourage their students to achieve; examples include acknowledging pupils' achievements and providing positive feedback for efforts to advance (Mimon, 2008; Ross, 1995; Throndsen, 2011).

3.3. Motivation to learn

Motivation to learn is important to children of all ages and is characterized by internal motivation—curiosity and control, the self-perception of being someone who can learn, and external motivation—the need for social recognition, feedback, and support from the teacher (Zusho, Pintrich, & Coppola, 2003).

Motivation to learn is a process that awakens, directs, and preserves people's behavior towards the achievement of a specific goal (learning), it reflects the sum of the factors that propel a person to behave in a certain way given existing circumstances. Pupils with motivation to learn math are driven toward achieving a goal such as proficiency in the subject and the need to provide the correct answer to questions (Denault & Guay, 2017).

Research shows that pupils who set a goal to become proficient in the material, who perceive the task at hand interesting, challenging and important, tend to engage in meta-cognitive activities more than other pupils; to activate cognitive strategies more often and to invest an effort in performing the task (Mimon, 2008; Pintrich, 1999; Pintrich & de Groot, 1990).

3.4. Learning disabilities: Unique difficulties

Special education lacks specific evaluation tools to examine a pupil's level of knowledge. A pupil with special needs must be supported through the learning process, first in acquiring basic knowledge that is possibly missing and then, as it becomes possible, in gaining the skills required by the second part of the curriculum. This support process must consider age appropriate skill level (Sharan, Shahar, & Levin, 1998).

The present research relates only to pupils with learning disabilities who study in special education classes within a conventional school setting. The importance of the current research is to determine to what degree a teaching approach which involves appropriate illustrative methods can improve the self-image and motivation to learn among pupils and produce significant benefits in learning the subject (Hutzler, Jacob, Almusani, & Bergman, 2001).

4. Active teaching, self-image and motivation to learn math in special education

Children with learning disabilities need special teaching methods that can locate and apply appropriate deductive ways to correct the deficiency or mitigate its damage. Use of active teaching in math instruction with selected pupils provides those pupils with an opportunity to perform math and mechanical operations from memory and to arrive at solutions to math problems. This approach also helps strengthen the pupil's self-image, social and collaborative skills (Margalit, 2003).

The awareness of the needs of pupils with learning disabilities is steadily increasing within the education system. An increasing number of pupils are referred for evaluation and granted accommodations to help them cope with tests more successfully. The need to collaborate the efforts of multiple educational and counseling teams in school has also been widely acknowledged and accepted into practice (Reiter, 2004).

The presence of pupils with learning disabilities transforms a conventional class into a completely heterogeneous setting that is usually riddled with problems. Conventional education teachers are not equipped with appropriate tools or training to deal with these types of pupils, a fact that may leave the pupils facing their individual challenges with no professional support (Pintrich, 1999; Roeser, Midgley, & Urdan, 1996; Zusho et al., 2003).

Math content is usually identified with rigid rules, terms and principles and sometimes the pupils are required to remember rules, principals, terms, ways to find solutions, comparison, relationships, math statements, and formulas without understanding them. For pupils to properly deal with math formulas they must remember principles, otherwise, they may find it very difficult to advance through to the next level of this intensive subject. On the other hand, a child with a learning disability is different from other children. Some special needs children lack visual and spatial perception and others have auditory processing, memory retention, motoric and language deficiencies; unique social and emotional as well as special cognitive and meta-cognitive characteristics. This widely varied array of characteristics makes it even more difficult to teach math to a pupil with a learning disability. An unconventional teaching approach such as active teaching is essential in supporting the efforts to adjust and simplify the material based on the pupil's individual level of skill (Bishara, 2013).

A teaching method is closely correlated with self-image and the motivation to learn. Pupils with a positive self-image, who believe in their ability, are more likely to advance in learning math despite their difficulties. Motivation to learn is a process that awakens and propels pupils to achieve a goal and to behave appropriately and pragmatically (Mimon, 2008; Pintrich & de Groot, 1990).

There are many challenges in the various educational aspects of teaching math to pupils with learning disabilities. In addition to the unique differences between the pupils, there are a wide range of external and environmental factors that impact teaching math to these population of pupils. It is necessary to determine which teaching methods yield the best results in the least amount of time. The purpose of this research is to examine the unique characteristics of two teaching methods: active teaching vs. traditional teaching as they are used to teach math in four special education classes of a middle school and to examine the impact of the teaching approach on improving self-image, and motivation to learn math and to determine how these factors boost pupils' achievements in learning math. We can assume that active teaching will lead to an enhanced self-image, greater motivation to learn math, and subsequently to an improvement in the achievements (Agran & Wehmeyer, 1999; Bishara, 2005; Margalit, 2003; Reiter, 2004; Ritz & Ben Ari, 1994; Ross, 1995; Throndsen, 2011).

5. Research question

To what extent are the teaching approach and the learner's self-image factors that motivate pupils with learning disabilities studying math in conventional school settings?

6. Research participants

Four multiple age (fourth to sixth grade) special education classes were sampled for this research. The classes were part of a conventional elementary school in the Arab sector. Two of the classes used the active teaching approach in math instruction, and the other two used the traditional approach. Each class has a small number of pupils so the research included a total of 40 pupils representing the final sample.

In the sampling process, attempts were made to sample classes where the background of the teachers was similar in terms of tenure and educational training in math. In the classes where the active approach was used, attempts were made to choose classes where the teachers had similar experience and training in the field of active teaching consistent with the pattern reflected in the teaching approach questionnaire. All the teachers who participated in the research were women with 3 to 36 years of experience teaching (M = 23.00, SD = 12.13) and from 3 to 32 years of experience teaching math (M = 15.67, SD = 10.78). The average number of years of education of the teachers was 15.67 (SD = 0.52). Four of the teachers held a B.Ed. degree and all of them had teaching certificates. In terms of academic qualification, three of the teachers were trained in special education, and one teacher in science (16.7%) and Arabic Literature (16.7%).

All the pupils participating were diagnosed with learning disabilities and studied in different conventional elementary schools in the Arab sector in the central region of Israel. The children in the sample have a normal range cognitive ability, but were diagnosed with attention deficits, and, in addition, they may take longer than usual to execute and complete tasks. As far as language skills are concerned, their vocabulary is poor and limited, they are familiar with letters and short form words but not with word structures. In arithmetic, they mastered addition and subtraction but have a difficult time with multiplication and division. They are also challenged in the areas of abstract thinking and in solving word problems. The socioeconomic background of the participants' families was average; most of the mothers are homemakers, and the fathers are employed earning average wages.

Significantly, in the special education classes of an elementary school, many of the children are not evaluated at an early age (i.e. kindergarten or first grade) but later (third and fourth grade). When they are evaluated, the policy is to integrate them into the conventional school system. As a result, the base for the research population in both groups is the same even though they are being taught using two different approaches, active teaching and traditional. The pupils evaluated began the special education classes at about the same time. None of them were exposed to the active teaching approach in math prior to the research so it is safe to assume that thus far, they had been taught math with the traditional method.

7. Research tools

7.1. Characterization of teaching approach

The four teachers participating in the research were asked to fill out the characterization of teaching approach questionnaire. The goal was to identify the teaching approach in the classroom, active vs. traditional, and to examine which of the elements of active teaching will be reflected in their work with the pupils. The questionnaire was created by Israeli (2008) and was adjusted to meet the needs of the present research. It is reliable and structurally relevant within the given sources and includes two parts: part A included variables of personal and professional background and part B questions regarding the character of the teaching approach [questions 1 to 9] and an examination of different indices for the active teaching approach [questions 10 to 19].

The questions in the last part are divided into seven areas: (a) use of varied, multi- directional material and stimuli during the lessons [5 questions: 2, 3, 4, 7, 16]; (b) team work in class [2 questions: 5, 6]; (c) use of alternative teaching, learning and evaluation methods by their definition [3 questions: 9, 8, 19]; (d) promoting intercultural and interactive conversation [2 questions: 14, 17]; (e) parent participation [1 question: 11]; (f) goals of teaching—developing social norms of mutual help and minimization of competition among pupils [1question: 11]; g. goals of teaching—teaching the given study material [1 question: 12].

Based on Yisraeli's examination (2008), the reliability coefficient (Alfa Cronbach) of the questionnaire's 19 items was high (α = 0.89). The reliability coefficient found for the sub-scales indicated they were also reliable (coefficient range 0.67—0.87). Based on the reliability coefficient, a total grade for

all items on the questionnaire was calculated for each teacher by adding up the scales of each item. The range of the grade was between 19 and 72. The higher the grade, the more active teaching is prevalent at the school as opposed to traditional teaching.

The total grade of the teaching approach questionnaire was used to classify the teachers into two distinct groups based on the median value of the grade (Median >50.50). The "traditional teaching" group included teachers whose grade was lower or equal to the median value and the "active teaching" group included teachers whose grade was higher than the median value.

The difference between these sub-groups in the total grade for the questionnaire was statistically significant: $t(4) = 7.00$, $p < 0.001$. It is important to note that the choice to accept teachers for the research was determined based on the pattern of their response to the teaching characterization questionnaire. In other words, the classes and the teachers were assigned to "active teaching" or "traditional teaching" after the results were reviewed.

7.2. Questionnaires of pupils' perceptions: Self-image, motivation and instructional approach

Pupil data were collected using three questionnaires with proven reliability and structural relevance:

(a) Questionnaire to examine self-image based on Eitan's version (Eitan, 1987). The questionnaire examined the child's attitude towards self in aspects that are directly connected to class and school: how they perceived themselves as a pupil in class. The questionnaire included 33 items of self-image in learning. The pupil is asked to compare himself to the pupil described using a five-level Richter scale (1 = I do not at all resemble him, 5 = I certainly resemble him).

We note here that five items were worded inversely compared with the rest of the items [12, 17, 20, 22, 26], in such a way that high rating of these items indicated a low self-image. For the purpose of statistical analysis these items were recoded.

The present research was conducted using tracking factor analysis with Varimax rotation for the 33 items in the self-image questionnaire. The division based on two factors resulted in two distinct content spheres that together explained 45.25% of the variance: (a) self-image personal-social (19 items, explanation of variance 28.40%, $\alpha = 0.92$. (b) Learning self-image (14 items, explanation of variance 16.85%, $\alpha = 0.80$). Reliability coefficient (Cronbach's α) for the 33 items included in the self-image questionnaire was very high $\alpha = 0.90$.

Based on the factor analysis findings and the reliability test, two index values were calculated for each participant in the self-image questionnaire that corresponded with the two questionnaire factors: index value personal-social self-image and index value learning self-image. An inclusive index value was also calculated. The values were calculated by averaging the items in each scale. The range of values was between one and five and the higher the value, the higher the self-image.

(b) Questionnaire to examine motivation to learn (Roeser et al., 1996). The questionnaire contains questions based on having control over the task and questions based on performance. The questionnaire includes 17 questions that examine the motivation to learn using five levels on a Richter scale (1 = strongly disagree, 5 = strongly agree).

The reliability test (Cronbach's α) conducted for the total scale and three sub- scales of the motivation to learn questionnaire yielded very high level of reliability: total scale [items 1–17],) $\alpha = 0.940$(, control over the task [5 items: 1, 4, 7, 10, 15], ($\alpha = 0.79$), ability to perform-avoid [6 items: 3, 6, 9, 12, 13, 17], ($\alpha = 0.85$), ability to perform-advance [6 items: 2, 5, 8, 11, 14, 16], ($\alpha = 0.80$).

Based on the findings of the reliability test, index values were calculated for each participant in the motivation to learn questionnaire that corresponded with the questionnaire factors (control over the task, ability to perform-avoiding and ability to perform-advancing). In addition, a total index value was calculated for motivation to learn. The indices were calculated by averaging the items associated with each factor. The range of the index values ranged from one to five, the higher the value, the higher the motivation to learn.

(c) The questionnaire that examines the teacher's approach to teaching math as perceived by the pupil (Roeser et al., 1996). The questionnaire is comprised of 11 questions designed to characterize the teaching method used by math teachers as perceived by the pupil using a Richter scale with five levels (1 = do not at all agree, 5 = very much agree).

The reliability test (Cronbach's α) conducted for the 11 items on the questionnaire found high level of reliability ($\alpha = 0.83$). Based on the reliability test results, a total index value was calculated for each participant in the questionnaire. The value was calculated by averaging the values of the items. The range of the values was between one and five. The higher the value, the more a pupil perceives the teacher's approach to be active.

8. Process

The research was conducted in four special education classes at a conventional elementary school setting in the Arab sector in central Israel. The researcher visited each school and met with each pupil. During these meetings, the pupil was asked to respond to the questionnaire in the presence of the researcher who also assisted with filling out the forms and addressing requests for clarification. In addition, the teachers in all four classes were asked to fill out the characterization of teaching approach questionnaire.

During the preliminary analysis, the compatibility of the characterization of the teaching approach reported by the teachers was compared to the characterization of the teaching approach reported by the pupils. The examination was conducted using the Chi-Square Test. In addition, during the preliminary analysis, the research assumptions were tested using One-Way MANOVA variance analysis. Verification of the research questions were examined through calculating hierarchical regression equations.

This statistical analysis explains the connection between the active and traditional teaching approaches, the level of self-image, and the motivation to learn math in special education classes.

9. Findings

9.1. Characterization of the teaching approach based on teachers' report and pupils' perception

During the preliminary analysis, we examined the correlation between the characterization of the teaching approach based on the teachers' reports and their pupils' perception. For that purpose, the pupils were classified in two groups based on the median value of the index that measures: characterization of teaching approach of the math teacher based on the pupil's perception (Median = 3.64). The group titled "Traditional Teaching Approach" included participants with grades lower or equal to the median value of the index ($n = 21$, 52.5%) and the group titled "Active Teaching Approach" included participants with grades higher than the median value of the index ($n = 19$, 47.5%).

Next, a χ^2 Test was conducted to examine independence between variable classification of teachers based on the teaching approach reported by the teachers and the variable classification of teachers based on pupils' perception as reported by them. Table 1 represents the distribution of pupils based on the two variables and the χ^2 test values to check the independence between the variables.

Table 1. Pupils distribution based on teaching approach as reported by teachers and teaching approach as reported by the pupils (*n* = 40)

Teaching approach–Pupils	Teaching approach–Teachers	
	Traditional	Active
Traditional	20	0
Active	1	19
	χ^2 (*df* = 1, *n* = 40) = 32.48***	

*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

The data in Table 1 indicates there is a highly significant correlation between the teaching approach as reported by teachers and the approach as reported by pupils χ^2 (*df* = 1, *n* = 40) = 32.48, $p < 0.001$).

All the students (100%) whose teachers were classified as traditional also classified their teachers' approach as traditional. In addition, a very high percentage of the pupils (95.0%) whose teachers were classified as active, classified their teachers' approach as active. Only one pupil whose teacher was classified as using the active approach classified his teacher's approach as traditional.

The pattern of the findings illustrates a correlation between the teachers' classification of their approach and the students' characterization of heir teachers' approach.

9.2. Self-image and motivation among the research participants (pupils with learning disabilities within a conventional school setting)

During the preliminary analysis, the averages and standard deviations were examined as well as the distribution of the indices self-image and motivation to learn among all the pupils participating in the research. Table 2 represents the averages and standard deviations of self-image indices.

The averages represented in Table 2 indicate that among all the pupils, the level of self-image in the general index and sub-indices was average to high (range of averages 3.54–3.71). Based on the skew values, the distribution of these indices was near normal and symmetric [SES = 0.37, (−0.02) − (−0.57] Table 3 represents the averages and standard deviations of motivation indices.

The averages represented in Table 3 indicate that among all the pupils, the level of motivation measured by the general index and the sub-indices was average to high (range of averages 3.70–3.77). Based on the skew values, the distribution of these indices was near normal and symmetric [SES = 0.37, (−0.16) − (−0.48)].

9.3. Differences in self-image indices among participants learning through different teaching approaches

Consistent with the research assumption, the self-image of pupils with learning disabilities is higher for pupils who learn through the active teaching approach than for pupils learning through the traditional approach.

To test this assumption a one-way MANOVA variance analysis was conducted. The dependent variables used were: the pupil's self-image indices (general index, personal and social self-image and academic self-image). The independent variable was teaching approach as reported by teachers; active teaching approach and traditional teaching approach.

Table 2. Averages and standard deviations of self-image indices among all research participants (*n* = 40)

Index	M	SD
Self-image general index	3.61	0.51
Self-image personal and social	3.54	0.62
Self-image academic	3.71	0.52

Note: The range of values is from one to five. The higher the value, the higher the self-image.

Table 3. Averages and standard deviations of motivation indices— pupils (*n* = 40)

Index	M	SD
Motivation–general index	3.75	0.72
Control of task	3.77	0.75
Performance abilities–avoiding	3.70	0.77
Performance abilities–advancing	3.77	0.72

Notes: The range of values is from one to five. The higher the value, the higher the level of motivation.

During the Multivariance Test, the self-image indices were tested simultaneously and one significant variance was found in the pupils' self-image based on the teaching approach $F(2, 37) = 156.44$, $p < 0.001$, $\eta p^2 = 0.89$. Table 4 represents the averagesstandard variances, the Univariate Test analysis values and the impact measure of the self-image indices – pupils based on teaching approach.

The Univariate Test analysis values represented in Table 4 validate the research assumption. There were significant variances based on the teaching approach in the self-image general index and the sub-indices personal and social self-image, and academic self-image. Based on the findings, in all three indices, the level of pupils' self-image was significantly higher in the active approach classes than in the traditional classes.

9.4. Differences in motivation to learn math among research participants learning through different teaching approaches

Another research assumption was that the motivation to learn math among pupils with learning disabilities who learn math using the active teaching approach is higher than that of pupils who learn using the traditional approach.

A one-way MANOVA test was conducted to test this assumption. The dependent variables were motivation to learn math indices (general index, control of task, ability to perform – avoiding, ability to perform – advancing). The independent variable was teaching approach as reported by teachers: active approach and traditional approach.

During the Multivariate Test, motivation to learn indices were checked simultaneously and a significant difference was found in the level of motivation to learn math based on the teaching approach used. $F(3, 36) = 77.75$, $p < 0.001$, $\eta p^2 = 0.87$. Table 5 represents the averages, standard deviations, the Univariate Test analysis values and the impact measure of the motivation to learn math indices based on teaching approach.

The Univariate Test analysis represented in Table 5 indicates that in accordance with the research assumption, there were significant differences based on the teaching approach in the general index motivation to learn math and sub-indices "control of task", "performance—avoiding" and "performance—advancing". Based on the averages and all four indices, the motivation to learn math was significantly higher among pupils being taught using the active approach than with pupils taught with the traditional approach. Consistent with the research assumption, among pupils taught using

the active approach, the level of motivation to learn math in all the indices was significantly higher than with the pupils being taught using the traditional approach.

9.5. Predicting motivation to learn math

The research question was designed to examine to which extent it becomes possible to predict the motivation to learn math based on the teaching approach used and self-image beyond the contribution of the teacher's personal and professional background.

Two hierarchical regression equations were calculated separately for each of the independent variables (teaching approach used by the teacher and the pupils' self-image). This is because a Multiconlinearity was discovered between these variables (VIF = 9.12). In both regression equations, the dependent variable was the general motivation to learn math. The regression was calculated using two stages, during the first stage, the variables relating to teachers' background were entered (tenure in teaching and tenure in math instruction).

It is worth noting that for several variables "teacher's backgrounds" were identical for all teachers and therefore excluded from the regression equation. These variables were: gender, academic qualification and teaching certificate. In addition, the range of "level of education" was limited (15–16 years) so this variable was excluded from the regression equations.

Table 4. Averages, standard variance, *F* values and ηp^2 values of the self-image indices—pupils based on teaching approach (n = 40)

Self-image indices	Teaching approach				*F*(1, 38)	ηp^2
	Traditional (n = 20)		Active (n = 20)			
	M	SD	M	SD		
Self-image general index	3.14	0.17	4.09	0.17	308.58***	0.89
Self-image–Personal and Social	3.02	0.38	4.07	0.26	106.45***	0.74
Self-image–academic	3.30	0.40	4.12	0.18	69.73***	0.65

Notes: The range of values is from one to five. The higher the value, the higher the level of self-image.

*$p < 0.05$.

**$p < 0.01$.

***$p < 0.001$.

Table 5. Averages, standard deviations, *F* values and ηp^2 values of the motivation to learn math indices based on teaching approach (n = 40)

Motivation to learn indices	Teaching approach				*F*(1, 38)	ηp^2
	Traditional (n = 20)		Active (n = 20)			
	M	SD	M	SD		
Motivation to learn general index	3.09	0.38	4.40	0.16	201.81***	0.84
Control of task	3.09	0.38	4.45	0.18	207.45***	0.84
Performance ability–Avoiding	3.04	0.46	4.37	0.31	114.94***	0.75
Performance ability–Advancing	3.15	0.46	4.39	0.19	123.81***	0.76

Notes: The range of values is from one to five. The higher the value, the higher the level of motivation to learn math.

*$p < 0.05$.

**$p < 0.01$.

***$p < 0.001$.

In the second stage, the independent variable was entered. The independent variable "teaching approach" was defined as a fixed variable (1 = active teaching approach, 0 = traditional teaching approach). The independent variable "self-image—pupils" was entered as a continuing variable. Table 6 represents the regression findings for motivation to learn math based on background variables—teachers and math teaching approach.

We see from Table 6 that during the first stage, where variables "teachers' background" of type "experience in teaching" and "in teaching math" were entered, the percentage of explained variance was 65% and the regression equation was significant $F(2, 37) = 34.45$, $p < 0.001$.

Based on the standardized regression coefficients (β), the general experience variable made a significantly negative contribution in explaining the difference in variance ($\beta = -0.84$, $p < 0.05$). The variable experience in teaching math, however, made a significantly positive contribution in explaining the difference in variance ($\beta = 0.22$, $p < 0.05$). Although the years of general teaching experience of the teachers did not increase the motivation of the students, more experience in teaching math had a strong effect.

During the second stage where the variable "teaching approach" was entered, the percentage of the confirmed variance was 85% and the regression equation was significant $F(3, 36) = 66.83$, $p < 0.001$. The addition to the explained variance was 20% and was determined to be significant $F(1, 36) = 46.63$, $p < 0.001$. Based on the standardized regression coefficient (β) the variable "teaching approach" had a significant positive contribution to the explained variance ($\beta = 0.84$, $p < 0.001$). In other words, the motivation to learn math is higher among pupils taught with the active approach than with pupils taught with the traditional approach. Table 7 represents the regression findings for predicting motivation to learn math based on background variables—teachers and self-image index—pupils.

The regression findings in the first stage are identical in both regression equations and their description is found, in the Table 7. During the second stage, where the pupil self-image index was entered, the percentage of the explained variance was 81% and the regression equation was

Table 6. Hierarchical regression findings to predict motivation to learn math based on background variables—teachers and math teaching approach

	First stage			Second stage		
	B	**SEB**	***β***	***B***	**SEB**	***β***
First stage						
Background variables						
General experience in teaching	−0.05***	0.01	−0.84***	−0.01	0.01	−0.10
Experience in teaching math	0.02*	0.01	0.22*	0.01	0.00	0.08
Second stage						
Teaching approach	–	–	–	1.20***	0.18	0.84***
ΔR^2	0.65***			0.85***		
ΔR^2	0.65***			0.20***		
ΔF	34.45***			46.63***		
Df regression	2			1		
Df residual	37			36		

*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

Table 7. Hierarchical regression findings for predicting motivation to learn math based on variables: Background—teachers and self-image—pupils

	First stage			Second stage		
	B	**SEB**	***β***	***B***	**SEB**	***β***
First stage						
Background variables						
General experience in teaching	−0.05***	0.01	−0.84***	−0.03***	0.01	−0.40***
Experience in teaching math	0.02*	0.01	0.22*	0.01	0.01	0.14*
Second stage						
Self-image	–	–	–	0.82	0.15	0.58***
ΔR^2	0.65***			0.81***		
ΔR^2	0.65***			0.16***		
ΔF	34.45***			28.80***		
Df regression	2			1		
Df residual	37			36		

*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.

significant $F(3, 36) = 49.82$, $p < 0.001$. The addition to the variance explanation was 16% and was found significant $F(1, 36) = 28.80$, $p < 0.001$.

Based on the standardized regression coefficient (β), the pupil self-image index made a significant positive contribution to the variance confirmation ($\beta = 0.58$, $p < 0.001$). The level of motivation to learn among pupils increases when their self-image is higher.

In conclusion, the pattern of the findings based on the regression equations indicates that in response to the research question, it is possible to predict the level of motivation to learn math among pupils based on the teaching approach the teachers choose and pupils' self-image, beyond the contribution of personal and professional background of the teachers.

It was also revealed that the level of motivation to learn math among the pupils is higher when the teachers use the active rather than the traditional teaching approach. In addition, the research indicated that the motivation to learn math among pupils increases as their self-image improves.

10. Discussion and summary

The goal of the present research was to examine the impact of the teaching approach and a pupil's self-image on the motivation to learn math among pupils with learning disabilities in conventional school settings.

The research question asked was, "To what extent are motivational factors affected by the approach used in teaching math and the self-image of pupils?"

The pattern of the findings from the regression equations indicated that it is possible to predict the level of motivation to learn math among pupils based on the teaching approach used by the teachers and the self-image of the pupils beyond the contribution of the teachers' personal and professional background. We found that the level of motivation to learn math is higher among the pupils when the teachers use the active approach.

In addition, the level of motivation to learn math increases as the pupils' self- image increases. We confirmed that the self-image among pupils with learning disabilities is higher for pupils being taught with the active teaching approach than for pupils taught with the traditional approach.

We also found that the general self-image, the personal and social self-image and the academic self-image among pupils taught with the active approach are significantly than for pupils taught with the traditional approach.

Professional literature in the area of learning and motivation indicates that motivation to learn is perceived at two levels: internal motivation–curiosity, control and the self-perception of one's ability to learn and external motivation—the need for social recognition, feedback and teacher's assistance. Motivation in learning is a process that awakens, directs, and preserves people's behavior towards the achievement of a specific goal (learning). It reflects the sum of the factors that propel a person to behave in a certain way given a certain situation.

Pupils motivated to learn math want to understand the material being taught and want to answer questions. Research indicates that pupils who set goals of mastering the material perceive the task as interesting, challenging and important, they tend to use meta-cognitive approaches and strategies more than others and invest much time in performing the task (Mimon, 2008; Pintrich & de Groot, 1990).

The present research findings are consistent with other studies, which indicate that active teaching may be a factor promoting motivation to learn (Mimon, 2008; Pintrich & de Groot, 1990).

Three main approaches in the literature define the term "self- image". The dynamic approach perceives the self through a developmental process, the humanitarian approach emphasizes the impact of the environment on the personal growth, and the cognitive-social approach perceives the self as an object of consciousness (Throndsen, 2011). Self-image towards math is the degree to which teachers believe their teaching efforts have a positive impact on their pupils' achievements, and the extent to which pupils believe they can advance in learning the subject on their own, despite the difficulty.

The findings of this research are similar and confirm that a learner's self-image promotes the motivation to learn.

Our research found that the active teaching approach contributed to improving the self-image of the pupils. Teachers who are innovative with their teaching approach, used more positive strategies to encourage their students to achieve, such as acknowledging pupils with extra attention (Mimon, 2008; Ross, 1995; Throndsen, 2011).

It is vital to emphasize ways to improve math instruction in the Arab sector. The evaluation method must include planning and thinking processes, not only final products. To accomplish this goal, it is important to use alternative evaluation methods such as conversation, monitoring pupils' progress in dealing with complex tasks, and activating self-reflective writing tasks. Furthermore, it is vital to create a supportive environment and avoid situations that arouse fear, and frustration as much as possible (Gazit, 2004; Reiter, 2004).

11. Recommendations and pedagogical implications

The present research examined two teaching approaches in math: active learning as compared with traditional learning in special education classes within a conventional school setting with the goal of improving the sense of self-esteem and motivation to learn math among the pupils.

We found that active teaching was more effective in promoting self-image and the motivation to learn among pupils than traditional teaching. The use of this approach should be increased. Active

teaching may have ramifications beyond math by reducing dropout rate, promoting pupil achievements and social interaction.

Math is also perceived to be one of the most difficult subjects at school and many pupils tend to fail making it that much more important to use the active teaching approach for the material being taught.

Further, through the active teaching approach, it is possible to highlight the social relationships and interactions among the pupils learning together in class, to emphasize the pupil activity in relation to the rate of personal progress, and to develop a curriculum and study materials that are more diverse and flexible. All of these put together are likely to become factors that support the teaching of this subject and the simplification of the material for pupils who experience difficulties.

12. Research limitations

Organizational variables that may also be connected to the characterization of the teaching approach and additional institutional variables that may affect self-image and motivation to learn were not examined. This limitation was also reflected in the small sample of the learners tested. Reporting the study on a larger sample would strengthen our findings.

Another limitation of the present research is its quantitative nature. A qualitative aspect based on interviews and observations would facilitate an in-depth and comprehensive examination of "teaching approach," "self-image," and "motivation to learn math" in special education classes as well as the ideological perceptions in the context of these variables.

Conducting a similar study in more diverse schools across a variety of sectors in Israeli society would enable us to learn more about the ways diverse socioeconomic perceptions influence the perception of the teaching approach, self-image, and the motivation to learn.

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References

Agran, M., & Wehmeyer, M. (1999). Teaching problem solving to students with mental retardation. *Innovations, 15*, 1–30.

Azzalis, L., Sato, S., Mattos, M., Fonseca, F., & Giavarotti, L. (2009). Active learning versus traditional teaching. *Journal of Biochemistry Education, 7*(2), 415–436.

Berger, Jean L., & Karabenick, Stuart A. (2010). Motivation and students use of learning strategies: Evidence of unidirectional effects in mathematics classrooms. *Learning and Instruction, 21*(3), 416–428.

Bishara, S. (2005). *Characteristics of school and improvement in achievements in basic areas of learning in reading comprehension and mathematics in students of special education in the Jewish and Arabic sectors* (PhD thesis). School of Education, Bar-Ilan University, Ramat-Gan. (In Hebrew).

Bishara, S. (2013, June). Active teaching and traditional teaching of mathematics in special education. *Mifgash, Journal of Social Educational Work, 21*, 119–142. (In Hebrew).

Denault, A., & Guay, F. (2017). Motivation towards extracurricular activities and motivation at school: A test of the generalization effect hypothesis. *Journal of Adolescence., 54*, 94–103. https://doi.org/10.1016/j.adolescence.2016.11.013

Eitan, T. (1987). *Improvement in self-image following an intervention program of collaborative learning in a multi-ethnic classroom* (MA thesis). School of Education, Bar Ilan University, Ramat Gan. (In Hebrew).

Fischbein, E. (1997). *Intuition in science and mathematics: An educational approach*. Dordrecht: Reidel.

Gazit, A. (2004). Teaching mathematics, interest and beauty-walked together and maybe not designed? In S. Phelps-Rosenblatt (Ed.), *Teachers in a changing world- Trends and challenges* (pp. 356–389). Raanana: The Open University. (In Hebrew).

Geary, D. G. (2004). Mathematics and Learning Disabilities. *Journal of Learning Disabilities, 37*(1), 4–15. https://doi.org/10.1177/00222194040370010201

Hutzler, Y., Jacob, T., Almusani, Y., & Bergman, A. (2001). *A guide to integrating children with physical disabilities in school and in the community*. Tel Aviv: Mofet Institute. (In Hebrew).

Israeli, T. (2008). *The connection between alternative assessment by means of research tasks, and the motivation and achievements in science in primary schools in the state-religious system* (MA thesis). School of Education, Bar- Ilan University, Ramat-Gan. (In Hebrew).

Kashti, Y., Arieli, M., & Shalsky, S. (1997). *Lexicon of Education and Teaching*. Tel Aviv: Ramot Publishing, Tel Aviv University. (In Hebrew).

Margalit, M. (2003). Resilience model among individuals with learning disabilities: Proximal and distal influences. *Learning Disabilities Research & Practice, 18*, 82–86. https://doi.org/10.1111/ldrp.2003.18.issue-2

Mimon, K. (2008). *The effect of coaching on task interpretation on achievement in the task, pedagogical self-efficacy and motivation in learning among teaching flowers* (MA thesis). School of Education, Bar Ilan University, Ramat-Gan. (In Hebrew).

Nottingham, S., & Verscheure, S. (2010). The effectiveness of active and traditional teaching in the orthopedic assessment laboratory. *Journal of College Science Teaching, 39*(5), 34–42.

Pintrich, P. R. (1999). The role of motivation in promoting and sustaining self-regulated learning. *International Journal of Educational Research, 31*, 459–470. https://doi.org/10.1016/S0883-0355(99)00015-4

Pintrich, P. R., & de Groot, E. V. (1990). Motivational and self regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82*, 33–40. https://doi.org/10.1037/0022-0663.82.1.33

Reiter, S. (2004). *Circles of brotherhood to break the connection between disability and loneliness*. Haifa: Achva Publishing. (In Hebrew).

Ritz, Y., & Ben Ari, R. (1994). *Teaching methods for the heterogeneous class*. Even Yehuda: Reches Publishing. (In Hebrew).

Roeser, R., Midgley, C., & Urdan, T. (1996). Perceptions of the school psychological environment and early adolescent's psychological and behavioral functioning in school: The mediating role of goals and belonging. *Journal of Educational Psychology, 88*, 408–422. https://doi.org/10.1037/0022-0663.88.3.408

Ross, J. A. (1995). Strategies for enhancing teachers' beliefs in their effectiveness: Research on a school improvement hypothesis. *Teachers College Record, 97*(2), 227–251.

Sharan, S., Shahar, H., & Levin, T. (1998). *The innovative school organization and teaching*. Tel Aviv: Ramot Publishing, Tel Aviv University. (In Hebrew).

Throndsen, I. (2011). Self-regulated learning of basic arithmetic skills: A longitudinal study. *British Journal of Educational Psychology, 81*(4), 558–578. https://doi.org/10.1348/2044-8279.002008

Zusho, A., Pintrich, P. R., & Coppola, B. (2003). Skill and will: The role of motivation and cognition in the learning of college chemistry. *International Journal of Science Education, 25*(9), 1081–1094. https://doi.org/10.1080/0950069032000052207

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