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The Effectiveness of a Suggested Program for Student – Teachers of Mathematics at Faculties of Education on Treating Mathematical Learning Disabilities and Developing Their Students Thinking Skills

Ph. D. Dissertation

Submitted in Partial Fulfillment of Ph. D. Degree in Education

(Curriculum and Mathematics Instruction)

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2011

Summary

This Summary tackles the research problem, aims, limitations, significance, hypotheses, procedures, the most significant results, recommendations and suggestions in light of the attained results.

Introduction :

The teachers' preparation programs aim mainly at preparing the teacher of the future who can overcome the disabilities facing his/ her students, attain a suitable learning setting, and lead the learning process. Good preparation is naturally reflected in the teacher's level of performance and consequently on his/ her students performance, attitudes and thinking methods.

Accordingly, when preparing mathematics teachers, it should be kept in mind that the aim is to have teachers who can take the responsibility of educating students in a way that enables them to learn mathematics and make sure at the same time that an acceptable amount of information and culture is being transferred to them so as to make them able to adapt to the world of today and its needs. The teacher should also be able to train students on the use of thinking skills when analyzing situations and life problems and avoiding taking hasty decisions that are based on no logical evidences and are not proved sound. The teacher should also be able to make his students acquire the basic mathematical skills that would enable them to carry out mathematical processes effectively and efficiently.

In this way, it is rather fundamental for mathematics teachers' preparation programs to equip student teachers with direct information and experiences about the mathematics courses taught in schools, acknowledging them about the problems students usually face in learning mathematics. In addition to providing them with the tools that might be used in diagnosing those disabilities and identifying their reasons and at the same time allow them to receive the suitable amount of experiences that might help in the selection of suitable teaching strategies and methods that would eventually enable them to overcome mathematics learning disabilities and correct and develop their students' thinking skills.

It cannot be argued that the groups in need for learning about thinking methods are those less involved in it, i.e. the underachievers who are in real need for learning about the know-how of thinking. The same applies to students facing learning disabilities as they are initially unable to match their peers in using thinking skills effectively though

they possess the ability to learn the aimed at skills if introduced in the suitable way using the suitable method to compensate for the strategies they failed to exhibit naturally by more effective ones.

Mathematics is considered the suitable medium for developing thinking and its skills as its nature comes in total accordance with thinking skills. Mathematics relies on building deductive beings that start by valid statements (introduction) that are used to draw logical results even when dealing with special cases. Mathematics also includes various rules that could be applied to varied situations. In addition, it requires the learner using its tools (language, facts, problems, skills and processes) and processes to be fully aware of his thinking processes to be able to use them to identify the possibility of aims achievement.

Thus, the development of thinking skills should be one of the most prominent aims of mathematics teaching as it might help the students overcome different disabilities and avoid mistakes resulting from incorrect thinking processes or lack of the suitable skills.

Sensing the study problem:

1. **Supervising practice teaching groups:** The researcher visited a number of classes taught by student teachers and noticed that they mostly failed to diagnose the disabilities facing pupils or to deal with mathematics underachievers. They usually preferred to avoid such pupils not even attempting to correct their mistakes or simplify their disabilities. It was also observed that student teachers preferred to present various problems hastily paying no attention to the standard of the pupils and not caring about the development of their thinking skills.
2. **Reviewing the methodology course specifications introduced to student teachers:** The researcher found out that mathematics methodology courses do not pay the due attention to pupils facing disabilities in studying mathematics when being compared to their number in schools.
3. **The viewpoints of education specialists and educational institutions reports:** Some of the educational institutions reports such as : Practice Teaching Seminar at the Faculty of Education, Fayoum (2008) , The International Conference of Learning Disabilities (2006) and Ayala (2002) showed and recommended

that: learning disabilities nowadays are quite common at schools; mathematics as a very significant subject that is closely related to various future courses should be specially concerned with dealing with students' learning disabilities; one of the most prominent competencies of a student teacher is the ability to handle disabilities facing pupils in addition to the development of thinking skills.

4. **A few related studies:** such as the studies of (Hala Hassan El-Quesy, 2008), (Nasser Khatab, 2005), (Kortering & Others, 2005), (Hana Hassan El-Mehrez, 2004), (Abdel-Aziz Mohamad Al-Abdel Gabar, 2002), (Walid Mohamad Abou Al-Maty, 2001) and (Shaban Hanfy Shaban, 2000) which revealed the existence of various disabilities facing mathematics learning disabilities and the existence of a large percentage of students facing disabilities in mathematics learning.

The Research Problem:

The problem of the research could be stated as follows:

1. There are many disabilities facing students in learning mathematics which led to the existence of a great percentage of students having mathematics learning disabilities in normal classes.
2. No attention is paid to the student-teachers' training on how to handle learning disabilities facing students through their teaching and methods of dealing with such students which led to a clear weakness in their abilities concerning that field.
3. The student-teachers do not attempt to develop their pupils' thinking skills especially those facing learning disabilities.

In this way, the research attempted to answer the main following question:

What is the effectiveness of a suggest program for mathematics student - teachers on mathematical learning disabilities and thinking skills , the effectiveness of their teaching a suggest program depending on some treatment strategies on treating the learning disabilities of the "Algebra Unit" and developing thinking skills of first year preparatory pupils ?

A number of sub-questions could be derived from the previously mentioned main questions:

1. *What is the effectiveness of a suggest program (The student-teachers booklet) for the mathematics section on developing their knowledge about mathematical learning disabilities and thinking skills ?*
2. *What is the effectiveness of a suggest program (The student-teachers booklet) for the mathematics section on developing their skills of treating mathematical learning disabilities and developing thinking skills of first year prepatary pupils ?*
3. *What is the effectiveness of a suggest program for pupils depending on some treatment strategies (The pupils booklet and The teacher's guide) on treating the learning disabilities of the "Algebra Unit" skills of first year prepatary pupils ?*
4. *What is the effectiveness of a suggest program for pupils depending on some treatment strategies (The pupils booklet and The teacher's guide) on developing thinking skills of first year prepatary pupils ?*
5. *What is the relationship between treating mathematical learning disabilities of the "Algebra Unit" and developing thinking skills?*
6. *What is the relationship between the results of the suggested program implementation on student teachers and their performance in observation sheet ?*

The Research Aims:

The current research aims at:

1. Defining the effectiveness of a suggest program (The student-teachers booklet) for the mathematics section on developing their knowledge about mathematical learning disabilities and thinking skills .
2. Defining the effectiveness of a suggest program (The student-teachers booklet) for the mathematics section on developing their skills of treating mathematical learning disabilities and developing thinking skills of first year prepatary pupils .
3. Defining the effectiveness of a suggest program for pupils depending on some treatment strategies (The pupils booklet and The teacher's guide) on treating the learning disabilities of the "Algebra Unit" of first year prepatary pupils .

4. Defining the effectiveness of a suggest program for pupils depending on some treatment strategies (The pupils booklet and The teacher's guide) on developing thinking skills of first year prepatary pupils .
5. Defining the relationship between treating mathematical learning disabilities of the "Algebra Unit" and developing thinking skills .
6. Defining the relationship between the results of the suggested program implementation on student teachers and their performance in observation sheet .

The Research Limitations:

The research is limited to:

1. The third year student teachers of mathematics section at the Faculty of Education, Fayoum University registered in the academic year (2009/2010) purposal sample because it is the faculty where the researcher works. The student teachers of that stage are at the beginning of practice teaching and are in need for the required skills to be used when handling mathematical learning disabilities. To state the fact, the number of those students is relatively large and the student teachers usually complain about not being able to deal with such category of pupils or help them to acquire the information needed to master mathematics.
2. A sample of first year prepatary pupils of Fayoum city schools during the scholastic year (2009/2010) because it is the beginning of the prepatary stage so it is important to handle those disabilities before the pupils join the higher classes.
3. The Algebra Unit introduced to the first year prep during the second term of the year (2009/2010), as it contains very important topics at which students face many disabilities such as: solving equations, inequalities, number patterns, solving story problems as revealed by some studies (Mahmoud Mohamed Hassan, 1991) (Naem Ben Mohamed El-Amry, 1997) (Mohamed Mahdoud Mesbah , 1996)(Ahmed Soid Mohamed Metwaly , 2005) (Bryant, Bryant & Hammill, 2000) (Bryant & Bryant, 2008). In addition to all the previous, through this unit a large number of thinking skills could be developed.
4. Some thinking skills necessary for treating mathematical learning disabilities that are suitable for the level of first year prepatary pupils and can be developed though the specified Algebra Unit as

defined by a group of studies and related literature such as (information processing, connections & relations recognition, classification, comparison, induction, deduction, suggesting possible solutions, hypotheses examination till finding the result, causes and results defining, evaluation and making judgments).

The Research Significance:

1. The current research is important as it deals with a highly important topic which is concerned with teaching mathematics for the purpose of overcoming mathematical learning disabilities and taking care of pupils facing such problems.
2. It helps student teachers in diagnosing and treatment of mathematics learning disabilities.
3. It helps program planners of Faculties of Education in focusing on helping student teachers in diagnosing and handling mathematics learning disabilities and developing pupils' thinking skills.
4. It helps researchers in making use of the two suggested program, the measuring tools and the diagnostic tools prepared by the researcher.

The Research Method:

The researcher made use of the quasi-experimental design which depends on the use of one experimental group in the program introduced to student teachers as its content is considered totally new. In addition, the researcher used the experimental-control groups design as the scholastic content the researcher depended on was not new for the pupils' sample.

The Research Tools:

The current research used the following tools:

1) The Requirement of Preparing The Experimental Tools :

1. *Mathematics learning disabilities list:* to identify the general disabilities facing first year preparatory pupils and hinder them when studying mathematics.
2. *Mathematics learning disabilities causes questionnaire:* to identify the causes of mathematics disabilities which face first year preparatory pupils in order to help in overcoming them.

2) The Experimental Tools:

The suggested program which includes:

1. *The suggested program for student-teachers (The student-teachers booklet) :*

It aims at providing them with knowledge about the disabilities facing pupils when learning mathematics, helping them in diagnosing these disabilities, identifying their causes, introducing experiences that might help them to use new teaching strategies and techniques when dealing with those disabilities, correct pupils' thinking faults and develop their thinking skills.

2. *The suggested program for pupils (The pupils' booklet and The teacher's guide) :*

The pupils' booklet which includes the activities to be carried out during the teaching process, and the teacher's guide to direct the teacher during the introduction of the unit to overcome mathematics learning disabilities and develop pupils' thinking skills.

3) The Measuring Tools:

1. *The student-teachers achievement test* : for measuring the level of student-teachers' knowledge about mathematics learning disabilities and thinking skills.
2. *Observation sheet of student-teachers* : for measuring the performance of student-teachers when dealing with the pupils' learning disabilities in mathematics and developing pupils' thinking skills.
3. *Achievement test in the "Algebra Unit"*: for measuring the first year preparatory pupils achievement level in the "Algebra unit".
4. *Thinking skill test in mathematics* : for measuring the first year preparatory pupils' thinking skills in mathematics.

The Research Hypotheses:

The researcher tested the following hypotheses:

- 1- There is a statistically significant difference between means of scores of **the experimental group (Students learning the Algebra Unit according to the treatment strategies) and control group (Students learning the Algebra Unit according to traditional methods)** in the post administration of **the achievement test in the " Algebra Unit "** in favor of the experimental one.
- 2- There is a statistically significant difference between means of scores of **the experimental group (Students learning the Algebra Unit according to the treatment strategies) and control group (Students learning the Algebra Unit according to traditional methods)** in the post administration of **thinking skills test in mathematics** in favor of the experimental one.
- 3- There is a statistically significant difference between means of scores ranks of student-teachers (**Students - teachers learned the suggest program about mathematical learning disabilities and thinking skills**) in the pre and post administration of **achievement test in the topic of this program** in favor of the post test.
- 4- There is a statistically significant difference between means of scores ranks of student-teachers (**Students - teachers learned the suggest program about mathematical learning disabilities and thinking skills**) in the pre and post administration of **observation sheet** in favor of the post test.
- 5- There is a statistically significant correlation between **mathematics learning disabilities treatment of pupils in the Algebra Unit and developing thinking skills.**
- 6- There is a statistically significant correlation between the administration **results of the suggested program on student-teachers and their performance in observation sheet .**

The Research Procedures:

The research followed the following steps:

- 1- Reviewing the related literature and previous studies dealing with :
 - the learning disabilities field in general and in mathematics specifically.
 - the development of thinking skills in general and those related to mathematics specifically
- 2- Preparing **a list of mathematics learning disabilities**, showing it to the jury members and adjusting it in light of their comments.
- 3- Preparing **a questionnaire to identify mathematics learning disabilities causes**, showing it to the jury members and adjusting it in light of their comments.
- 4- Preparing **the student teacher's booklet** including methods of diagnosing and overcoming mathematics learning disabilities and training them on how to deal with pupils suffering from them. It also introduces knowledge about how to teach in a way that helps in overcoming these disabilities and developing their students' thinking skills, showing it to the jury members and adjusting it in light of their comments.
- 5- Preparing **the pupils' booklet** including the activities that should be done during the teaching process, showing it to the jury members and adjusting it in light of their comments.
- 6- Preparing **the teacher's guide** to help them during teaching the unit using the treatment strategies to overcome mathematics learning disabilities and develop pupils thinking skills, showing it to the jury members and adjusting it in light of their comments
- 7- Preparing **the achievement test in "Algebra Unit"** for the first year preparatory pupils introduced during the second term to define the disabilities the pupils face when learning the specified unit, showing it to the jury members and adjusting it in light of their comments.
- 8- Preparing **the thinking skills test in mathematics** for the first year preparatory pupils and showing it to the jury members and adjusting it in light of their comments.
- 9- Selecting a sample of **mathematics student-teachers** of the Faculty of Education, Fayoum University.
- 10-Administering **the observation sheet** to student teachers to gain pre-data.

- 11-Administering **the achievement test of the mathematics learning disabilities and thinking skills** to student teachers to gain pre-data.
- 12-Teaching **the suggested program (program including about mathematics learning disabilities and thinking skills)** to the sample of student teachers.
- 13-Selecting a sample of **first year preparatory pupils** randomly from some Fayoum schools to whom the student teachers teach.
- 14-Administering **the achievement test in the Algebra Unit and thinking skills test in mathematics** to the sample of pupils to gain pre-data.
- 15-Teaching the pupils sample the Algebra Unit according to **the suggested treatment strategies throughout the practice teaching sessions by the student teachers.**
- 16-Administering **the observation sheet** to student teachers to gain post-data.
- 17-Administering **the achievement test of mathematics learning disabilities and thinking skills** to student-teacher to gain post-data.
- 18-Administering **the achievement test in the Algebra Unit and thinking skills test in mathematics** to the sample of pupils to gain post-data.
- 19-Recoding the results and making statistical analysis.
- 20-Testing the hypotheses.
- 21-Analysis and explaining the results.
- 22-Suggestions and recommendations

The Research Results:

In the light of the previously introduced procedure, the results revealed that:

- 1- There is a statistically significant difference between means of scores of **the experimental group (Students learning the Algebra Unit according to the treatment strategies) and control group (Students learning the Algebra Unit according to traditional methods)** in the post administration of **the achievement test in the " Algebra Unit "** in favor of the experimental one.

- 2- There is a statistically significant difference between means of scores of **the experimental group (Students learning the Algebra Unit according to the treatment strategies) and control group (Students learning the Algebra Unit according to traditional methods)** in the post administration of **thinking skills test in mathematics** in favor of the experimental one.
- 3- There is a statistically significant difference between means of scores ranks of student-teachers (**Students - teachers learned the suggest program about mathematical learning disabilities and thinking skills**) in the pre and post administration of **achievement test in the topic of this program** in favor of the post test.
- 4- There is a statistically significant difference between means of scores ranks of student-teachers (**Students - teachers learned the suggest program about mathematical learning disabilities and thinking skills**) in the pre and post administration of **observation sheet** in favor of the post test.
- 5- There is a statistically significant correlation between **mathematics learning disabilities treatment of pupils in the Algebra Unit and developing thinking skills**.
- 6- There is a statistically significant correlation between the administration **results of the suggested program on student-teachers and their performance in observation sheet** .

The Research Recommendations:

In the light of the results, the researcher recommends the following:

- 1- Paying more attention to the production of educational aids which help in teaching mathematics, overcoming mathematics learning disabilities, and activating pupils' thinking. It would also provide an interesting educational environment governed by freedom, safety and stability which helps in achieving and developing creativity.
- 2- Establishing learning disabilities centers in the Faculties of Education that include an integral group of teaching staff and demonstrators interested in the learning disabilities field. These centers help in training pre-service student teachers, introducing educational instructions to families and parents on methods of

helping their sons to overcome their learning disabilities. In addition to carrying out research works and studies which might contribute in developing styles and techniques of treating learning disabilities.

- 3- Reviewing the current assessment methods and exams by including questions that measure the students' thinking abilities to encourage them to think, and use effective thinking skills.
- 4- Preparing diagnostic tools for learning disabilities at the beginning of every term for early diagnosis of mathematics learning disabilities to help in introducing treatment services at the suitable time and making learners more able for learning new mathematical topics.

The Research Suggestions:

In light of the research results, the researcher recommends conducting the following studies:

- 1- Studying the effect of using treatment teaching strategies suggested in the program in teaching mathematics on the development of other learning aspects (e.g. different thinking styles, learning retention).
- 2- Studying The effect of using other treatment teaching Strategies in teaching mathematics on developing thinking skills.
- 3- Studying the development of thinking skills of mathematics learners.
- 4- Studying the effect of using suggested teaching strategies and suggested educational programs on treating mathematical learning disabilities.
- 5- Studying the effect of using suggested teaching strategies and suggested educational programs on development of thinking skills in mathematics.
- 6- Studying the effect of using suggested programs for student-teachers and teachers on teaching special needs students (e.g. visually impaired, hearing impaired, mentally handicapped, attention deficits and hyperactivity disorders, the gifted).
- 7- Conducting a study for determining the training needs of mathematics teachers in light of different treatment teaching strategies.