



Mansoura University
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The Role of Concrete Manipulative Materials in Improving the Achievement Level of Visually Handicapped Students in Mathematics.

**A Summary of a Thesis Submitted to Obtain the Master
Degree in Education.**
(Curriculum and instruction of Mathematics).

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Study Summary

1.1 Aim of the Study

The study aimed at investigating the role of concrete manipulative materials (modified algebra tiles) in comparison to the traditional methods of teaching in enhancing the achievement levels of visually handicapped students in mathematics. The study focused on the unit of algebraic terms and expressions studied by the visually handicapped students in middle schools in the school year 2002-2003.

1.2 Significance of the Study

The significance of the study lies in:

1. The study may help the teachers and the program designers of the visually handicapped students to acknowledge the ways of concrete manipulative materials (modified algebra tiles), which are used in some activities – that make use of the rest of the senses of the visually handicapped students – to teach and develop some mathematical concepts and skills.
2. Designing some activities using concrete manipulative materials (modified algebra tiles) that can be used by the visually handicapped students.
3. Getting the teachers of the visually handicapped students to consider the importance of using concrete manipulative materials in teaching mathematics to their students.
4. Presenting a simple contribution in answering the increasing need for a large number of studies in the field of mathematics for the visually handicapped. The suggested unit is considered a step towards designing and using precisely measured programs for such students.

1.3 Background of the study

The researcher became aware of the problem of the study through the following resources:

- The unsuitability of the books studied by the visually handicapped to the nature of their visual handicap.
- The results of the questionnaire which have shown the lack of a certain framework for teaching mathematics for the visually handicapped.
- The results and recommendations of the previous studies and international projects in the field of teaching mathematics related to the subject of the study in general and teaching to the visually handicapped in particular, which have shown the importance of teaching mathematics for the visually handicapped in a manipulative method that depends on the rest of the senses.

1.4 Problem of the Study and Study Questions

The study investigated the following basic question "**What is the role of concrete manipulative materials (modified algebra tiles) in enhancing the achievement level of the visually handicapped students in mathematics?** "

This question is branched out into the following sub-questions:

1. How could we reshape the unit of algebraic terms and expressions using concrete manipulative materials (modified algebra tiles) in order to be taught to the visually handicapped students?
2. What is the effectiveness of the concrete manipulative materials (modified algebra tiles) in enhancing the achievement level of the visually handicapped students concerning the unit of algebraic terms and expressions?

1.5 Hypotheses of the Study

In the light of the previous studies and international projects, the hypotheses of the study had been set as follows:

1. There is a significant statistical difference at the level of the significance (0.05) between the mean rank of the marks of the two groups of the study, i.e. the experimental and the control groups, in favour of the experimental group on the post-test implementation.
2. The concrete manipulative materials (modified algebra tiles) are effective in enhancing the achievement level of the visually handicapped students in the unit of algebraic terms and expressions, as Blacke's ratio exceeds whole one.

1.6 Limitations of the Study

The study was bound by the following limitations:

Content Sample: The study was limited by teaching the unit of algebraic terms and expressions using the modified algebra tiles to the visually handicapped students.

Population Subjects: The study was limited to a sample of seventh grade visually handicapped students in Al-Noor Schools in Dakahliya, Damietta, and Cairo.

1.7 Variables of the Study

The variables, in this study, were classified as follows:

1. **Independent Variable:** This is the variable whose effect is to be measured in this study. This variable is represented in the method of teaching used, and it has two levels: the first level depends on using concrete manipulative materials (modified algebra tiles) and it is used with the students of the experimental

group. The second level is the traditional one, which is used with the students of the control group.

2. **Dependent Variable:** This is the variable whose effect on the independent variable is to be measured before and after the experimental implementation. This variable is represented in the educational achievement in mathematics as measured by the achievement test prepared by the researcher.

1.8 Instrument of the Study

The researcher designed an achievement test on the unit of algebraic terms and expressions.

1.9 Procedures of the Study

To answer the study questions and to examine the validity of its hypotheses, the researcher went through the following procedures:

1. Developing the concrete and manipulative materials (modified algebra tiles) to teach the unit of algebraic terms and expressions to the visually handicapped students.
2. Reshaping the content of the unit of algebraic terms and expressions in a way that suits/fits the nature of the visual handicap.
3. Preparing a teacher's guide for the unit of algebraic terms and expressions including some signs and principles that would help the teacher in teaching the unit to the visually handicapped students.
4. Preparing an achievement test on the unit of algebraic terms and expressions.
5. Subjecting the unit, the teacher's guide, and the achievement test to the judgment of the experts and the educationalists to judge their suitability to the nature of the visual handicap and making the suitable modifications in the light of their suggestions.
6. Reprinting the unit and the achievement test in Braille language to be easily administrated to on the visually handicapped students.
7. Implementing a preliminary experiment for the achievement test that aims at analysing its items, measuring its factor of constancy, and determining the time of the test.
8. Implementing a pre-achievement test on both groups i.e. the experimental and the control groups.
9. Teaching the unit of algebraic terms and expressions using concrete manipulative materials (modified algebra tiles) for the visually handicapped students of the experimental group.
10. Implementing a post-achievement test on both groups i.e. the experimental and control groups.

11. Collecting data, statistically manipulating and explaining it, and answering the questions of the study.
12. Presenting suitable suggestions and recommendations to make full use of the study results.

1.10 The Study Results

The results of the study are:

1. There is a significant statistical difference at the level of 0.05 between the mean ranks of marks of the two groups of the study, i.e. the experimental and the control groups, in favour of the experimental group on the post-test implementation.
2. The effectiveness of the modified concrete manipulative materials (modified algebra tiles) in enhancing the achievement level of visually handicapped students concerning the unit of algebraic terms and expressions.

1.11 Structure of the thesis

The Thesis was composed of 5 chapters, a list of bibliography, 12 appendices, and Arabic and English summaries

The five chapters are described as follows:

Chapter 1: Problem of the Study

In this chapter, the framework of the entire thesis was presented, which includes background of the problem, problem of the study and study questions, aim of the study, significance of the study, hypotheses of the study, limitation of the study, variables of the study, instrument of the study, terms of the study, and procedures of the study.

Chapter 2: Review of the literature

In this chapter, prior literature related to the subject of the study was reviewed in five domains:

- Handicapped and visually handicapped students.
- Characteristics and needs of the visually handicapped students.
- The visually handicapped students education.
- Teaching and learning mathematics for the visually handicapped students.
- Concrete manipulative materials and its significance in teaching and learning mathematics for the visually handicapped students.

Chapter 3: Related Studies and International Projects

In this chapter, related studies and international projects related to the subject of the study was reviewed in three domains:

- Studies related to the use of concrete manipulative materials in teaching and learning mathematics.
- Studies related to teaching and learning mathematics for the visually handicapped students.
- International projects related to teaching and learning mathematics for the visually handicapped students.

Then, the researcher presented his commentary on related studies and projects.

Chapter 4: Procedures of the Study

In this chapter, the researcher presented in detail how he had developed the algebra tiles to suit/fit the nature of visual handicap and how he reshaped the content of the unit of algebraic terms and expressions using the modified algebra tiles. He also presented developing procedures of both the teacher's guide and the achievement test. Procedures of the experimental study were also presented in terms of administration of pre-test, administration of the modified unit, and administration of the post-test

Chapter 5: Finding, Interpretation, Conclusion, and Recommendation

The chapter presents the statistical analysis results of testing the study hypotheses as well as interpretation and implications of these results in the light of the literature review and purposes of the study. It also includes recommendations pertinent to the findings of the program and concludes with the suggestion for further research related to the use of concrete manipulative materials in mathematics education, and the visually handicapped students education

The 12 appendices are titled as follows:

Appendix 1: A list of jury members who validated the instruments of the study.

Appendix 2: Results of content analysis of the unit of algebraic terms and expressions.

Appendix 3 : Teacher's guide for teaching the unit of algebraic terms and expressions.

Appendix 4: The unit of algebraic terms and expressions after reshaping it using the modified algebra tiles.

Appendix 5: A list of references which are used in developing both the teacher's guide and the reshaped unit.

Appendix 6: A list of the instructional objectives which are measured by the achievement test.

Appendix 7: The achievement test in its seeing format.

Appendix 8: Raw data for the visually handicapped students in the pilot study of the achievement test.

Appendix 9: Results of statistical analysis for the achievement test items.

Appendix 10: Answers key of the achievement test.

Appendix 11: Raw data for both groups of the visually handicapped students in the pre-test administration

Appendix 12: Raw data for both groups of the visually handicapped students in the post-test administration