

# ABSTRACT

## **- INTRODUCTION:**

Since we are living in the era of information revolution and the cultural openness, teaching thinking and its skills became a major objective for education. Curricula experts have to pay more interest of it. Educators also have to master it in order to teach it to the students because thinking skills are the key and tools for education and problem solving.

The present study aimed at developing the student teachers' mathematical skills because the literature and the pilot study revealed the low level of the prospective teachers. Therefore, there was a serious need for the present research.

## **- RESEARCH PROBLEM:**

The problem of the present study was the low level of the mathematics student teachers in the mathematical thinking skills. The main question was:

*- How can the mathematical thinking skills of student teachers at the mathematics section in the faculties of education be developed?*

This problem was hoped to be solved through answering the following four sub-questions:

- 1- What are the mathematical thinking skills necessary for the student teachers at mathematics section in faculties of education?
- 2- To what extent do the student teachers master the mathematical thinking skills?

- 3- What is the suggested program for developing the mathematics student teachers' mathematical thinking skills?
- 4- What is the effectiveness of the suggested program in developing these skills among the mathematics student teachers?

### **- RESEARCH DELIMITATIONS:**

The present study limited itself to the following:

- 1) A sample of students in the mathematics section at Benha Faculty of Education.
- 2) Developing the mathematical thinking indicated in its nine types: induction. Deduction, generalization, mathematical logic, mathematical proof, symbolic expression, spatial visualization, rational thinking and probable thinking.

### **- RESEARCH HYPOTHESES:**

The present study attempted to verify the following hypotheses:

- 1) There are statistically significant differences between the means of the students' scores on the pre-testing and the post-testing of mathematical thinking skills as a whole, in favour of the latter.
- 2) There are statistically significant differences between the means of the students' scores on the pre-testing and the post-testing of generalization skill, in favour of the latter.
- 3) There are statistically significant differences between the means of the students' scores on the pre-testing and the post-testing of spatial visualization skill, in favour of the latter.

- 4) There are statistically significant differences between the means of the students' scores on the pre-testing and the post-testing of mathematical proof skill, in favour of the latter.
- 5) There are statistically significant differences between the means of the students' scores on the pre-testing and the post-testing of analysis skill, in favour of the latter.
- 6) There are statistically significant differences between the means of the students' scores on the pre-testing and the post-testing of relationships extracting skill, in favour of the latter.
- 7) There are statistically significant differences between the means of the students' scores on the pre-testing and the post-testing of solution-reaching idea skill, in favour of the latter.
- 8) There are statistically significant differences between the means of the students' scores on the pre-testing and the post-testing of multi-solution proof skill, in favour of the latter.
- 9) There are statistically significant differences between the means of the students' scores on the pre-testing and the post-testing of solution checking skill, in favour of the latter.
- 10) The program is effective in developing the mathematical thinking skills concerned with in the present study.

#### **- RESEARCH PROCEDURES:**

- 1) Reviewing the Arabic and foreign literature on the thinking concept and its skills.
- 2) Preparing a list of mathematical thinking skills, in the light of the literature review, and measuring its validity and reliability.
- 3) Preparing a test to measure the mathematical thinking skills and measuring its validity and reliability.

- 4) Designing the suggested program, following these steps:
  - A- Defining the objectives.
  - B- Selecting the content.
  - C- Determining the suitable methods of the teaching strategy.
  - D- Identifying the instructional media and activities.
  - E- Suggesting the assessment tools.
  - F- Defining the learning resources.
- 5) Choosing the sample.
- 6) The pre-application of the test , determine their level in those skills.
- 7) Experimenting the program.
- 8) The post-application of the test.
- 9) Recording data and analyzing them statistically.
- 10) Stating and interpreting the research findings.
- 11) Suggesting the recommendations and further research ideas.

### **- RESEARCH FINDINGS:**

The present study revealed the following findings:

- 1) There were statistically significant differences at 0.01 between the means of the students' scores on the pre-testing and the post-testing of mathematical thinking skills as a whole, in favour of the latter.
- 2) There were statistically significant differences at 0.01 between the means of the students' scores on the pre-testing and the post-testing of generalization skill, in favour of the latter.

- 3) There were statistically significant differences at 0.01 between the means of the students' scores on the pre-testing and the post-testing of spatial visualization skill, in favour of the latter.
- 4) There were statistically significant differences at 0.01 between the means of the students' scores on the pre-testing and the post-testing of mathematical proof skill, in favour of the latter.
- 5) There were statistically significant differences at 0.01 between the means of the students' scores on the pre-testing and the post-testing of analysis skill, in favour of the latter.
- 6) There were statistically significant differences at 0.01 between the means of the students' scores on the pre-testing and the post-testing of relationships extracting skill, in favour of the latter.
- 7) There were statistically significant differences at 0.01 between the means of the students' scores on the pre-testing and the post-testing of solution-reaching idea skill, in favour of the latter.
- 8) There were statistically significant differences at 0.01 between the means of the students' scores on the pre-testing and the post-testing of multi-solution proof skill, in favour of the latter.
- 9) There were statistically significant differences at 0.01 between the means of the students' scores on the pre-testing and the post-testing of solution checking skill, in favour of the latter.
- 10) The suggested program was effective in developing the mathematical thinking skills as a whole. The Blake's gain value was 1.4 which is higher than the cut value 1.2. The program was also effective in developing each skill, the Blake's gain value for each one was higher or equal to the cut value 1.2.

\*\*\*\*\*