

Summary of the study

Problem of the study

The problem of this study stems from the apparent lack of secondary grade students skills related to tackling the "function of real variable" topic as well as their inability to draw its functions and conclude the required results the math curriculum delivered to students (enrolled in the GSC humanistic branch) in Egypt. The study attributes this shortcoming to using traditional ineffective teaching methodologies. Therefore; the study used a proposed Mathematica Program-based Algebra teaching strategy to help students to: master the basic required skills in drawing various functions, achieving the desired precision in their drawing, and tackling related mathematical concepts.

Questions of the study

The study tried to answer the following main question:

"What's The Effectiveness Of a Teaching Strategy Based On The Use MATHEMATICA Program In Teaching Algebra To Secondary School Students In The Development Of Their Intelligences And Achievement Of Mathematics?"

The following sub-questions are derived from the above main one:

1. What's the effectiveness of using the proposed Mathematica Program based teaching strategy in teaching Algebra?
2. What's the effectiveness of using the proposed Mathematica Program in developing students' academic achievement in Algebra?
3. What's the effectiveness of using the proposed Mathematica Program in developing students' visual-spatial intelligence in Algebra?
4. What's the effectiveness of using the proposed Mathematica Program in developing students' logical-mathematical intelligence?

Hypotheses of the study

The study tested the following five hypotheses:

1. There's a significant difference at the 0.05 level between the mean scores of both experimental and control groups' students at the applied academic achievement test for the function of real variable unit; in favour of the experimental group's subjects.
2. There's a significant difference at the 0.05 level between the mean scores of both experimental and control groups' students at the applied logical-mathematical intelligence scale; in favour of the experimental group's subjects.
3. There's a significant difference at the 0.05 level between the mean scores of both experimental and control groups' students at the applied visual-spatial intelligence scale; in favour of the experimental group's subjects.

Sample of the study

The sample of the study comprised two classes randomly (N = 60 students of both sexes) selected from one of the communal private schools at the 6th of October City, affiliated to the Sixth of October Governorate. For the purpose of conducting this study; the researcher divided his participant subjects into two groups: the first one is experimental (N = 30 students) studying the function of real variable unit using the proposed Mathematica Program-based teaching strategy in teaching Algebra, while the other is a controlled group (N = 30 students) studying the same instructional unit using the familiar traditional teaching method.

Limitation of the study

The current study has the following three main limitations:

1. Topic Limitations, including:

- Application of the Mathematica Program, the 5.2 version, for the year 2005.
- Second-secondary grade students (enrolled in the GSC humanistic branch).
- The function of real variable unit (the second secondary graders' first instructional unit in the applied Algebra curriculum).

- Measuring the effectiveness of the proposed Mathematica Program-based teaching strategy in developing participant subjects' academic achievement (at the recalling, comprehension, application and analysis levels).
 - Measuring the effectiveness level of the proposed Mathematica Program-based teaching strategy in developing participant subjects' both visual-spatial and logical-mathematical intelligence.
2. **Spatial Limitations**, the study limited its scope on Second secondary grade students (enrolled in the GSC humanistic branch classes at a school located at Sixth of October Governorate.
 3. **Temporal Limitations**, the study tools were practically administered during the period between 22nd September and 30th November, 2008, two periods weekly.

Method of the study

The researcher employed two basic scientific methods in conducting the current study, as follows:

1. **The Quasi Experimental Method**: It was used to test the effectiveness of a specific independent variable (i.e. the Mathematica Program-based Algebra teaching strategy) in influencing a number of dependent variables (namely: academic achievement, both visual-spatial, and logical-mathematical intelligence).
2. **The Descriptive Method**: It was mainly used here to collect the required data and observations about the phenomenon under investigation as it's existing in reality in addition to interrupt and analyze the available data on research various variables.

Study Tools

The researcher used the following tools in conducting The study:

1. **The Proposed Mathematica Program-based Algebra Teaching Strategy** (prepared by the researcher).
2. **An Academic Achievement Test** to measure students' achievement levels at the function of real variable unit (the second-secondary graders' first instructional unit in the applied Algebra curriculum to the GSC humanistic branch during the first semester). Basically, it focuses on measuring their recalling, comprehension, application and analysis levels (prepared by the researcher).

3. **The MIDAS Visual-Spatial Intelligence Scale** designed by Branton Sheror (1994), and translated into Arabic by Rana Koshha in 2002.
4. **The MIDAS Logical-Mathematical Intelligence Scale** designed by Branton Sheror (1994), and translated into Arabic by Rana Koshha in 2002.

Design of the study

The present study employed the pre-post two experimental-control groups design. Its sample was divided into two main groups, as follows:

1. **The Experimental Group**: it included those students studying the function of real variable unit using the proposed Mathematica Program-based Algebra teaching strategy.
2. **The Control Group**: It included those students studying the same instructional unit using the traditional method.

Variables of the study

The current study included the following variables:

1. **Independent Variable**: It was the proposed Mathematica Program-based Algebra teaching strategy effect on teaching the function of real variable unit in Algebra curriculum, delivered to second-secondary graders at the GSC humanistic branch.
2. **Dependent Variables**: They included The subjects' academic achievement, visual-spatial, and logical-mathematical intelligence.

Procedures of the study

To answer the first question of the study, the researcher:

1. Reviewed previous related literature and references with the current research variables to enable him to prepare the study theoretical framework.
2. Determined the required foundations to design the proposed Mathematica Program-based Algebra teaching strategy formulating a complete formula for its components.
3. Analyzed the content of the function of real variable unit to help him prepare a suitable list containing its different skills that can be developed using the proposed teaching strategy as well as presenting it to a group of arbiters to verify its standardization, reliability and validity.

4. Prepared the proposed teaching strategy.

To answer the second question of the study, the researcher:

- 1. Designed an academic achievement test to measure subjects', comprehension, application and analysis levels of the function of real variable unit and standardize its usage in The light of the unit instructional goals and content analysis so as to present it to a group of arbiters to verify validity ,and calculate its reliability.**
- 2. Selected the research sample randomly from second-secondary graders at the GSC humanistic branch and divided it into two groups: experimental and control.**
- 3. Applied the designed academic achievement test on both groups.**
- 4. Taught the selected unit to both groups using the proposed teaching strategy with the experimental group students by the researcher and the traditional method with those of the control group by another maths teacher.**
- 5. Applied the designed academic achievement test on both groups.**

In order to answer the study third and fourth questions, the researcher:

- 1. Applied both MIDAS visual-spatial and logical-mathematical intelligence scales, designed by Branton Sherowr and translated into Arabic by Rana Koshha in 2002.**
- 2. Applied the visual-spatial intelligence pre- test on both groups.**
- 3. Applied the logical-mathematical intelligence pre- test on both groups.**
- 4. Applied the visual-spatial intelligence post-test on both groups.**
- 5. Applied the logical-mathematical intelligence post- test on both groups.**

Finally, having finished these above-mentioned procedures, the researcher:

- 1. Analyzed his collected data statistically to test the research hypotheses and conclude its results as well as interpret it in a plausible manner.**
- 2. Presented the research final suggestions and recommendations in The light of its results.**

Statistical Techniques:

The researcher used the computer in analyzing the collected data employing the (SPSS) program in tackling the following statistical operations:

1. Calculation of the total sample mean scores and standard deviations.
2. Using Alpha Cronbach quotient to calculate the applied tools reliability.
3. Using correlation co-efficient equations to calculate the correlation level between the research variables and total scores.
4. Using the T-Test for paired samples to compare both research groups.

Results of the study

1. There was a significant difference at 0.05 level between the mean scores of both experimental and controlled groups' students at the applied academic achievement test for the function of real variable unit; in favour of the experimental group.
2. There was a significant difference at 0.05 level between the mean scores of both experimental and controlled groups' students at the applied logical-mathematical intelligence scale; in favour of the experimental group .
3. There was a significant difference at 0.05 level between the mean scores of both experimental and controlled groups' students at the applied visual-spatial intelligence scale; in favour of the experimental group.

Recommendations:

Based on the previous results; the researcher recommended the following:

1. Allocating parts of various school libraries to provide advanced educational programs in math for students' home usage so that they can learn according to their diverse needs and circumstances.
2. Linking science in general, and maths in particular, with modern technology and benefiting from this massive technological advance in serving and promoting science.
3. Training math teachers and supervisors , on how to deal with the modern advanced maths instructional programs that address several problems encountered by students in learning maths so that they can

effectively contribute to supporting them and raising maths teachers' intellectual, cultural and professional levels.

Recommended Further Research:

In The light of the above results and suggestions; the researcher recommended focusing on tackling the following topics in future studies:

- 1. Effect of training prospective maths teachers at faculties of education on how to master the required skills to draw and study mathematical functions by using the computer in general, and the Mathematica program in particular, before embarking on teaching them to school students.**
- 2. Effect of applying the Mathematica program on overcoming various difficulties encountered by students when studying maths at the level of diverse educational stages and maths branches.**
- 3. Conducting similar studies based on measuring the effectiveness of the Mathematica program in developing a certain specific pattern of intelligence.**
- 4. Attempting to identify effects of applying the Mathematica program on promoting students' attitudes towards learning maths.**
- 5. Repetition of conducting the current study at the same time we modify its sample size as its probable that this change may lead to obtaining different results in the future.**
- 6. Attempting to identify effects of applying the Mathematica program on promoting students'**
